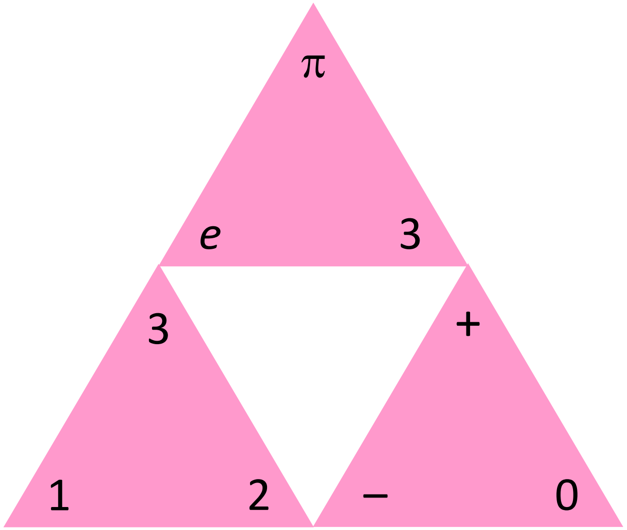
The tripartition of the chemical elements

Observations, considerations and hypotheses about the chemical elements and the number 3

H
1

Nb
41

Tc
43



Pm
61

Bi
83

Version 13 from 28 August 2023

Dr. Frank Lichtenberg / Physicist

https://novam-research.com

This paper in form of a presentation comprises 89 pages, a content overview, and can be downloaded as pdf via the following link (file size about 1 MB):

https://novam-research.com/resources/Chem-elements-and-number-3.pdf

Preface

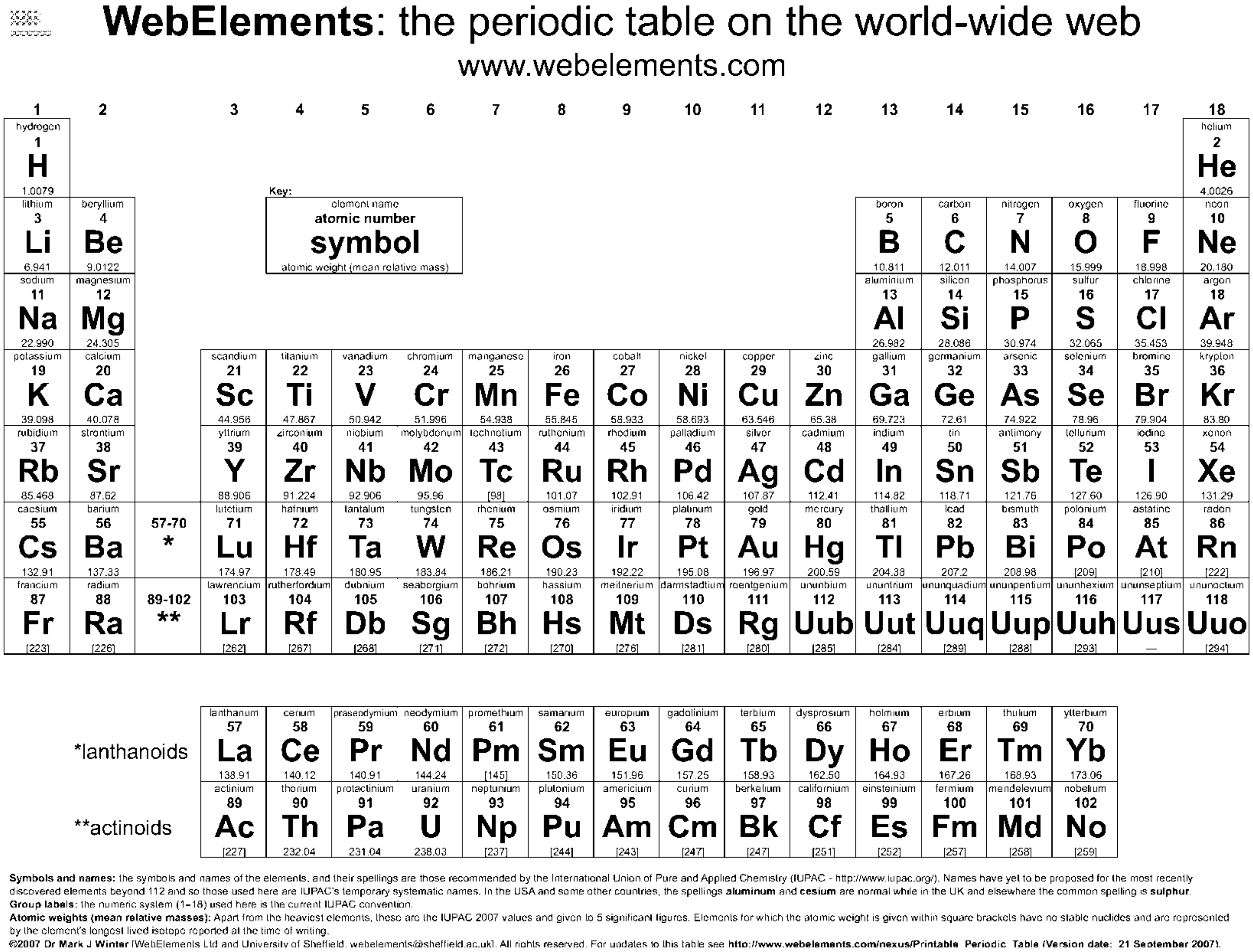
This work presents some observations, considerations, and hypotheses concerning the chemical elements and the number 3. It is shown that the number 3 is in various ways strikingly present at the chemical elements and their properties. Especially we present a tripartition of the chemical elements. It is assumed that the presence of the number 3 and the tripartition has a physical origin and implies a physical significance. The tripartition may possibly be used to select a specific set of elements for the design of systems with special properties. The tripartition can be derived in two different ways, namely by Global Scaling (a holistic approach in science) and by an assumed special role of the number 3. The tripartition is considered in the context of some observations and open questions from some areas of physics such as superconductivity, searching for room temperature superconductors, and novel LENR-based energy technologies. Also presented are fundamental considerations about the number 3 and numbers in general and why numbers are not only abstract physical quantities but possibly also physical quantities which are potentially able to cause physical effects. This work comprises also an introduction into Global Scaling and some associated open questions.

Some general notes

References in the text to other pages are underlined, for example page 21 . That facilitates their adjustment in case of a modified or updated version of this presentation

In this presentation the chemical elements are mostly named with their symbol and their atomic number, i.e. their number of protons or electrons per atom. For example, Nb 41 stands for the element niobium which has the symbol Nb and the atomic number 41

The common arrangement of the chemical elements: The Periodic Table



WebElements: the periodic table on the world-wide web

www.webelements.com

Key:

element name
atomic number
symbol
atomic weight (mean relative mass)

1	2		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
hydrogen 1 **H** 1.0079																		helium 2 **He** 4.0026
lithium 3 **Li** 6.941	beryllium 4 **Be** 9.0122												boron 5 **B** 10.811	carbon 6 **C** 12.011	nitrogen 7 **N** 14.007	oxygen 8 **O** 15.999	fluorine 9 **F** 18.998	neon 10 **Ne** 20.180
sodium 11 **Na** 22.990	magnesium 12 **Mg** 24.305												aluminium 13 **Al** 26.982	silicon 14 **Si** 28.086	phosphorus 15 **P** 30.974	sulfur 16 **S** 32.065	chlorine 17 **Cl** 35.453	argon 18 **Ar** 39.948
potassium 19 **K** 39.098	calcium 20 **Ca** 40.078		scandium 21 **Sc** 44.956	titanium 22 **Ti** 47.867	vanadium 23 **V** 50.942	chromium 24 **Cr** 51.996	manganese 25 **Mn** 54.938	iron 26 **Fe** 55.845	cobalt 27 **Co** 58.933	nickel 28 **Ni** 58.693	copper 29 **Cu** 63.546	zinc 30 **Zn** 65.38	gallium 31 **Ga** 69.723	germanium 32 **Ge** 72.61	arsenic 33 **As** 74.922	selenium 34 **Se** 78.96	bromine 35 **Br** 79.904	krypton 36 **Kr** 83.80
rubidium 37 **Rb** 85.468	strontium 38 **Sr** 87.62		yttrium 39 **Y** 88.906	zirconium 40 **Zr** 91.224	niobium 41 **Nb** 92.906	molybdenum 42 **Mo** 95.96	technetium 43 **Tc** [98]	ruthenium 44 **Ru** 101.07	rhodium 45 **Rh** 102.91	palladium 46 **Pd** 106.42	silver 47 **Ag** 107.87	cadmium 48 **Cd** 112.41	indium 49 **In** 114.82	tin 50 **Sn** 118.71	antimony 51 **Sb** 121.76	tellurium 52 **Te** 127.60	iodine 53 **I** 126.90	xenon 54 **Xe** 131.29
caesium 55 **Cs** 132.91	barium 56 **Ba** 137.33	57-70 *	lutetium 71 **Lu** 174.97	hafnium 72 **Hf** 178.49	tantalum 73 **Ta** 180.95	tungsten 74 **W** 183.84	rhenium 75 **Re** 186.21	osmium 76 **Os** 190.23	iridium 77 **Ir** 192.22	platinum 78 **Pt** 195.08	gold 79 **Au** 196.97	mercury 80 **Hg** 200.59	thallium 81 **Tl** 204.38	lead 82 **Pb** 207.2	bismuth 83 **Bi** 208.98	polonium 84 **Po** [209]	astatine 85 **At** [210]	radon 86 **Rn** [222]
francium 87 **Fr** [223]	radium 88 **Ra** [226]	89-102 **	lawrencium 103 **Lr** [262]	rutherfordium 104 **Rf** [267]	dubnium 105 **Db** [268]	seaborgium 106 **Sg** [271]	bohrium 107 **Bh** [272]	hassium 108 **Hs** [270]	meitnerium 109 **Mt** [276]	darmstadtium 110 **Ds** [281]	roentgenium 111 **Rg** [280]	ununbium 112 **Uub** [285]	ununtrium 113 **Uut** [284]	ununquadium 114 **Uuq** [289]	ununpentium 115 **Uup** [288]	ununhexium 116 **Uuh** [293]	ununseptium 117 **Uus** —	ununoctium 118 **Uuo** [294]

*lanthanoids	lanthanum 57 **La** 138.91	cerium 58 **Ce** 140.12	praseodymium 59 **Pr** 140.91	neodymium 60 **Nd** 144.24	promethium 61 **Pm** [145]	samarium 62 **Sm** 150.36	europium 63 **Eu** 151.96	gadolinium 64 **Gd** 157.25	terbium 65 **Tb** 158.93	dysprosium 66 **Dy** 162.50	holmium 67 **Ho** 164.93	erbium 68 **Er** 167.26	thulium 69 **Tm** 168.93	ytterbium 70 **Yb** 173.06
**actinoids	actinium 89 **Ac** [227]	thorium 90 **Th** 232.04	protactinium 91 **Pa** 231.04	uranium 92 **U** 238.03	neptunium 93 **Np** [237]	plutonium 94 **Pu** [244]	americium 95 **Am** [243]	curium 96 **Cm** [247]	berkelium 97 **Bk** [247]	californium 98 **Cf** [251]	einsteinium 99 **Es** [252]	fermium 100 **Fm** [257]	mendelevium 101 **Md** [258]	nobelium 102 **No** [259]

Symbols and names: the symbols and names of the elements, and their spellings are those recommended by the International Union of Pure and Applied Chemistry (IUPAC - http://www.iupac.org/). Names have yet to be proposed for the most recently discovered elements beyond 112 and so those used here are IUPAC's temporary systematic names. In the USA and some other countries, the spellings **aluminum** and **cesium** are normal while in the UK and elsewhere the common spelling is **sulphur**.

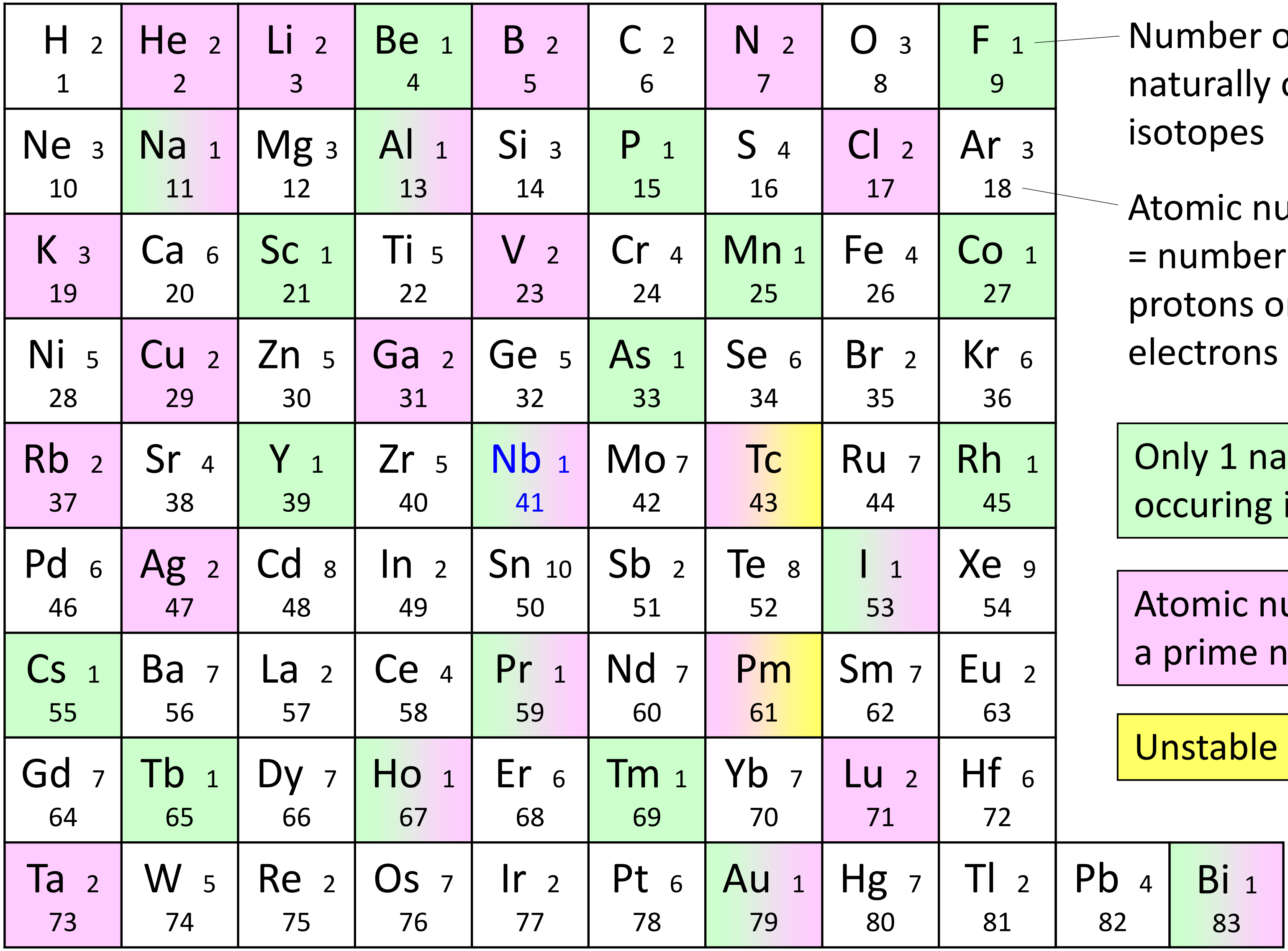
Group labels: the numeric system (1–18) used here is the current IUPAC convention.

Atomic weights (mean relative masses): Apart from the heaviest elements, these are the IUPAC 2007 values and given to 5 significant figures. Elements for which the atomic weight is given within square brackets have no stable nuclides and are represented by the element's longest lived isotope reported at the time of writing.

https://www.webelements.com

Another arrangement of the chemical elements until the last stable element Bi 83

The elements Tc 43 and Pm 63 and all with atomic number ≥ 84 are radioactive and not stable



H 2 1	He 2 2	Li 2 3	Be 1 4	B 2 5	C 2 6	N 2 7	O 3 8	F 1 9		
Ne 3 10	Na 1 11	Mg 3 12	Al 1 13	Si 3 14	P 1 15	S 4 16	Cl 2 17	Ar 3 18		
K 3 19	Ca 6 20	Sc 1 21	Ti 5 22	V 2 23	Cr 4 24	Mn 1 25	Fe 4 26	Co 1 27		
Ni 5 28	Cu 2 29	Zn 5 30	Ga 2 31	Ge 5 32	As 1 33	Se 6 34	Br 2 35	Kr 6 36		
Rb 2 37	Sr 4 38	Y 1 39	Zr 5 40	Nb 1 41	Mo 7 42	Tc 43	Ru 7 44	Rh 1 45		
Pd 6 46	Ag 2 47	Cd 8 48	In 2 49	Sn 10 50	Sb 2 51	Te 8 52	I 1 53	Xe 9 54		
Cs 1 55	Ba 7 56	La 2 57	Ce 4 58	Pr 1 59	Nd 7 60	Pm 61	Sm 7 62	Eu 2 63		
Gd 7 64	Tb 1 65	Dy 7 66	Ho 1 67	Er 6 68	Tm 1 69	Yb 7 70	Lu 2 71	Hf 6 72		
Ta 2 73	W 5 74	Re 2 75	Os 7 76	Ir 2 77	Pt 6 78	Au 1 79	Hg 7 80	Tl 2 81	Pb 4 82	Bi 1 83

Number of naturally occuring isotopes

Atomic number = number of protons or electrons per atom

🟩 Only 1 naturally occuring isotope

🟪 Atomic number is a prime number

🟨 Unstable element

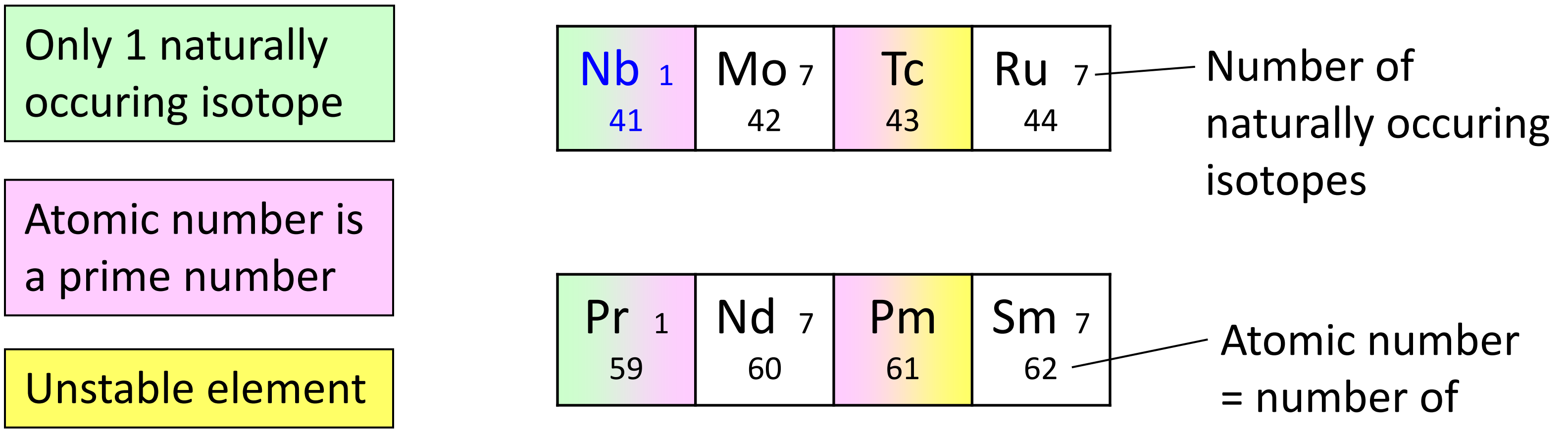
The reason why Nb 41 is highlighted by a blue color is explained on page 19

The unstable chemical elements Tc 43 (technetium) and Pm 61 (promethium)

The elements Tc 43 and Pm 61 and all with atomic number ≥ 84 are radioactive and not stable

Observation 1a: The unstable elements Tc 43 and Pm 61 have some common features:

- Their atomic numbers 43 and 61 are prime numbers
- Their adjacent elements, Mo 42 (molybdenum) and Ru 44 (ruthenium) as well as Nd 60 (neodymium) and Sm 62 (samarium), have all 7 naturally occuring isotopes
- Their after next elements leftwards, Nb 41 (niobium) as well as Pr 59 (praseodymium), have only 1 naturally occuring isotope and their atomic number is a prime number



🟩 Only 1 naturally occuring isotope

🟪 Atomic number is a prime number

🟨 Unstable element

Nb 1 41	Mo 7 42	Tc 43	Ru 7 44
Pr 1 59	Nd 7 60	Pm 61	Sm 7 62

Number of naturally occuring isotopes

Atomic number = number of protons or electrons per atom

Hypothesis 1a: This is not accidental, i.e. there is a deeper reason for it

The reason why Nb 41 is highlighted by a blue color is explained on page 19

The distribution of the stable and unstable chemical elements

Observation 1b: There are 3 groups or sections of stable elements and 3 groups or sections of unstable elements (see e.g. webelements.com and page 10):

H 1 ... Mo 42   Tc 43   Ru 44 ... Nd 60   Pm 61   Sm 62 ... Bi 83   Po 84 ... Uuo 118

This distribution of the stable and unstable elements and the presence of the number 3 is striking

Hypothesis 1b: This is not accidental, i.e. there is a deeper reason for that

About the naturally occuring isotopes of the stable chemical elements

The following can be read e.g. from page 10:

Observation 2a: The stable elements whose atomic number is a prime number have not more than 3 naturally occuring isotopes:

- 1 element (K) with 3 isotopes
- 12 elements with 2 isotopes
- 8 elements with 1 isotope

Altogether $21 = 7 \times 3$ elements whose atomic number is a prime number

The presence of the number 3 is striking. All other elements have not more than 10 naturally occuring isotopes

Hypothesis 2a: This is not accidental, i.e. there is a deeper reason for hat

Observation 2b: Among the 81 stable elements are 20 elements with only 1 naturally occuring isotope and they are never adjacent with respect to their atomic number

Hypothesis 2b: This is not accidental, i.e. there is a deeper reason for that

9 = 3 × 3 stable chemical elements with nearly 1 naturally occuring isotope 1 / 2

As mentioned on the previous page, among the 81 stable elements are 20 elements which have only 1 naturally occuring isotope. The remaining (81 – 20) = 61 elements have several naturally occuring isotopes (see page 10)

Observation 2c: A consideration of the isotope distribution of each of the 61 elements which have several isotopes, see e.g. www.webelements.com , reveals that the following 9 elements differ significantly from the other (61 – 9) = 52 elements because they have a markedly sharp isotope distribution such that 1 of their isotopes has an overwhelming abundance:

Element and its number of protons per atom or nucleus	H 1	He 2	C 6	N 7	O 8	Ar 18	V 23	La 57	Ta 73
Number of neutrons per atom or nucleus of its isotopes	0 1	2 1	6 7	7 8	8 9 10	22 20 18	28 27	82 81	108 107

For each of these elements the abundance of its isotopes is ≥ 98.9 atom-% for the isotope marked in red and ≤ 1.1 atom-% for the isotope(s) marked in blue. These elements can be called elements that have nearly 1 naturally occuring isotope. The number of these elements is 9 = 3 × 3 and they have not more than 3 naturally occuring isotopes, i.e. the presence of the number 3 is striking

9 = 3 × 3 stable chemical elements with nearly 1 naturally occuring isotope 2 / 2

Let`s consider now a few facts from the biology on earth: The bodies of biological species consist of water H_2O and organic materials whose main components are hydrogen H, carbon C, nitrogen N, and oxygen O. Vital for the corporal life on earth are water as well as air which consists 99 % of nitrogen N_2 and oxygen O_2

Observation 2d: The main components of organic materials, water, and air, namely H 1 (hydrogen), C 6 (carbon), N 7 (nitrogen), and O 8 (oxygen), belong all to the group of the 9 = 3 × 3 elements which have nearly 1 naturally occuring isotope (see previous page) !

Hypothesis 2d: This is not accidental, i.e. there is a deeper reaon for that. The specific isotope distribution of these elements (see previous page) or the physics behind it plays possibly an essential role in the biophysics and biochemistry of the bodies of biological species

Note: The organic molecule DNA comprises another important element, namely P 15 (phosphorus) which is a component of phosphate groups which are part of the DNA. Interestingly, P 15 has only 1 naturally occuring isotope (see e.g. page 10) and is therefore, with respect to this feature, similar to the elements with nearly 1 natural occuring isotope

29 stable chemical elements which have only 1 or nearly 1 naturally occuring isotope

Observation 2e:

There are 9 = 3 × 3 stable elements which have a markedly sharp isotope distribution and they have not more than 3 naturally occuring isotopes (see page 14). Because of the sharpness of their isotope distribution we may say that these 9 = 3 × 3 elements have nearly 1 naturally occuring isotope

There are 20 stable elements which have only 1 isotope (see page 10)

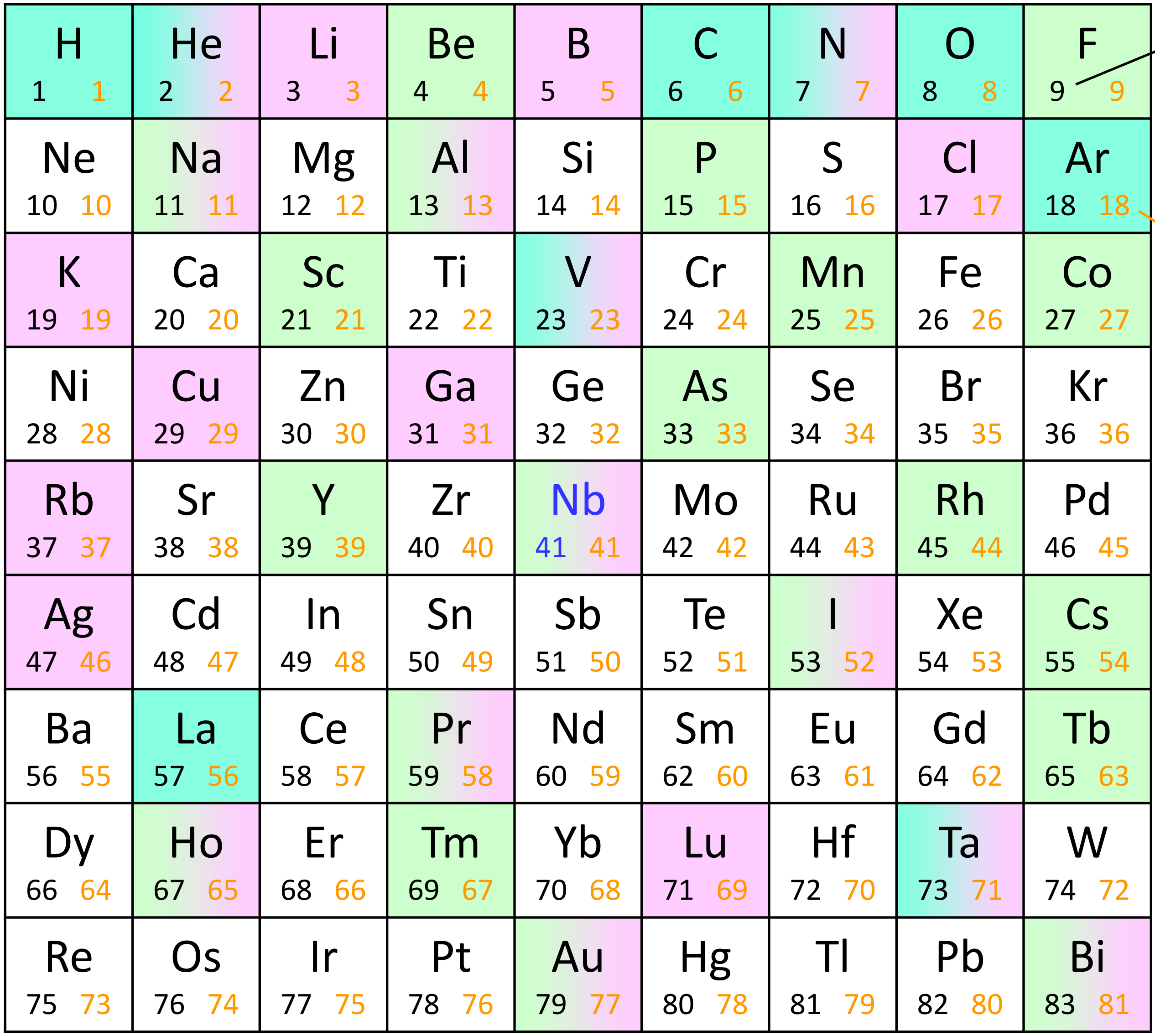
Overall this results in 9 + 20 = 29 elements which have only 1 or nearly 1 naturally occuring isotope and 29 is a prime number

The presence of the number 3 and a prime number, namely 29, is striking

An arrangement of the 81 = 3 × 3 × 3 × 3 stable chemical elements

If we omit in the arrangement on page 10 the unstable elements Tc 43 and Pm 61, then we obtain the following arrangement:

The reason why Nb 41 is highlighted by a blue color is explained on page 18



H 1 1	He 2 2	Li 3 3	Be 4 4	B 5 5	C 6 6	N 7 7	O 8 8	F 9 9
Ne 10 10	Na 11 11	Mg 12 12	Al 13 13	Si 14 14	P 15 15	S 16 16	Cl 17 17	Ar 18 18
K 19 19	Ca 20 20	Sc 21 21	Ti 22 22	V 23 23	Cr 24 24	Mn 25 25	Fe 26 26	Co 27 27
Ni 28 28	Cu 29 29	Zn 30 30	Ga 31 31	Ge 32 32	As 33 33	Se 34 34	Br 35 35	Kr 36 36
Rb 37 37	Sr 38 38	Y 39 39	Zr 40 40	Nb 41 41	Mo 42 42	Ru 44 43	Rh 45 44	Pd 46 45
Ag 47 46	Cd 48 47	In 49 48	Sn 50 49	Sb 51 50	Te 52 51	I 53 52	Xe 54 53	Cs 55 54
Ba 56 55	La 57 56	Ce 58 57	Pr 59 58	Nd 60 59	Sm 62 60	Eu 63 61	Gd 64 62	Tb 65 63
Dy 66 64	Ho 67 65	Er 68 66	Tm 69 67	Yb 70 68	Lu 71 69	Hf 72 70	Ta 73 71	W 74 72
Re 75 73	Os 76 74	Ir 77 75	Pt 78 76	Au 79 77	Hg 80 78	Tl 81 79	Pb 82 80	Bi 83 81

Atomic number = number of electrons or protons per atom

Numbering of the box and element

Nearly 1 naturally occuring isotope (see page 13)

Only 1 naturally occuring isotope

Atomic number is a prime number

There are 81 = 3 × 3 × 3 × 3 stable chemical elements

Observation 3: The number of stable chemical elements is $81 = 3 \times 3 \times 3 \times 3 = 3^4$

The presence of the number 3 is striking

Hypothesis 3: This is not accidental, i.e. there is a deeper reason for that

We speculate / assume that the presence or special meaning of the number 3 originates from the three states of an oscillation which can be called minus, plus, and zero.

This can be considered as a consequence of another related hypothesis, namely that all particles such as electrons and protons, which are the building blocks of atoms and matter, are itself oscillation states. For example, particles can be considered as (special) oscillation or vortex states of an everywhere present substratum which is called space, vacuum, or ether. For references and links see page 74

81 = 3 × 3 × 3 × 3 stable chemical elements and the chemical element Nb 41

Nb 1
41

The chemical element Nb 41 (niobium) shows several special features

Nb 1
41

Observation 4a: Nb 41 is located at a central position and therefore it is highlighted in a blue color:

- When 81 elements are arranged with equal distance in form of a linear or one-dimensional chain, then No. 41 is located at the central position
- When 81 elements are arranged in form of a two-dimensional 9 × 9 square lattice as shown on page 17 , then No. 41 is located at the central position
- When 81 elements are arranged in form of a four-dimensional 3 × 3 × 3 × 3 cube, cube, then No. 41 is located at the central position. From a mathematical point of view this is obvious, even if a four-dimensional space is hard to imagine

Observation 4b: Nb 41 has only 1 naturally occuring istope

Observation 4c: The atomic number of Nb 41 is a prime number

Observation 4d: Among all superconducting chemical elements Nb 41 has the highest superconducting transition temperature T_c , namely $T_c \approx 9$ K = - 264 °C, see e.g. http://hyperphysics.phy-astr.gsu.edu/HBase/tables/supcon.html

81 = 3 × 3 × 3 × 3 stable chemical elements and the chemical element Nb 41

Hypothesis 4.1: The particular features of Nb 41 which are listed on the previous page are not accidental, i.e. there is a deeper reason for that

Nb 1
41

Hypothesis 4.2: Superconductivity at room temperature can be achieved by a special material which contains Nb 41 as crucial chemical element. Of course, such a material requires another specific features

Nb 1
41

As a concrete example we refer to a special class of materials, namely oxides of the type $A_nB_nO_{3n+2} = ABO_x$. Some of their specific features suggest that they might have a potential to create room temperature superconductors and they are also known for B = Nb. For more information we refer to two publications which can be downloaded via the following links:

https://novam-research.com/resources/Research_Project_Room_Temperature_Superconductors.pdf

https://dx.doi.org/10.3929/ethz-b-000424221

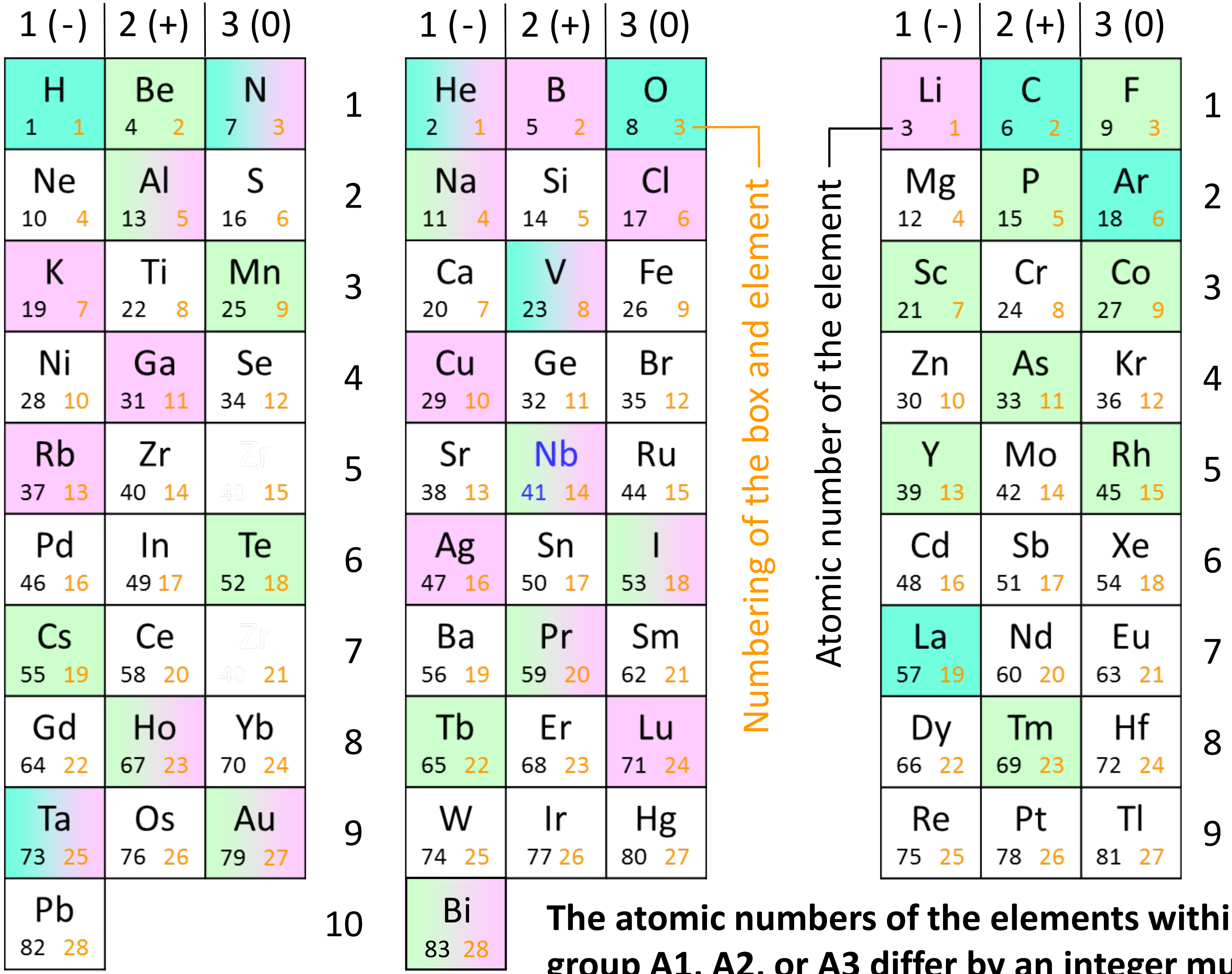
The tripartition of the 81 = 3 × 3 × 3 × 3 stable chemical elements

On the following page we present a tripartition of the stable chemical elements. It can be derived in two different ways which are presented in appendix 1 and 2, namely

1) by Global Scaling which represents a holistic approach in science, see appendix 1, especially appendix 1 - 2

2) by an assumed special role of the number 3, see appendix 2

The tripartition of the 81 = 3 × 27 = 3 × 3 × 3 × 3 stable chemical elements 1 / 5



Group A1 (-) 1, 4 or 7

	1 (-)	2 (+)	3 (0)
1	H 1 1	Be 4 2	N 7 3
2	Ne 10 4	Al 13 5	S 16 6
3	K 19 7	Ti 22 8	Mn 25 9
4	Ni 28 10	Ga 31 11	Se 34 12
5	Rb 37 13	Zr 40 14	Zr 40 15
6	Pd 46 16	In 49 17	Te 52 18
7	Cs 55 19	Ce 58 20	Zr 40 21
8	Gd 64 22	Ho 67 23	Yb 70 24
9	Ta 73 25	Os 76 26	Au 79 27
10	Pb 82 28		

Group A2 (+) 2, 5 or 8

	1 (-)	2 (+)	3 (0)
1	He 2 1	B 5 2	O 8 3
2	Na 11 4	Si 14 5	Cl 17 6
3	Ca 20 7	V 23 8	Fe 26 9
4	Cu 29 10	Ge 32 11	Br 35 12
5	Sr 38 13	Nb 41 14	Ru 44 15
6	Ag 47 16	Sn 50 17	I 53 18
7	Ba 56 19	Pr 59 20	Sm 62 21
8	Tb 65 22	Er 68 23	Lu 71 24
9	W 74 25	Ir 77 26	Hg 80 27
10	Bi 83 28		

Group A3 (0) 3, 6 or 9

	1 (-)	2 (+)	3 (0)
1	Li 3 1	C 6 2	F 9 3
2	Mg 12 4	P 15 5	Ar 18 6
3	Sc 21 7	Cr 24 8	Co 27 9
4	Zn 30 10	As 33 11	Kr 36 12
5	Y 39 13	Mo 42 14	Rh 45 15
6	Cd 48 16	Sb 51 17	Xe 54 18
7	La 57 19	Nd 60 20	Eu 63 21
8	Dy 66 22	Tm 69 23	Hf 72 24
9	Re 75 25	Pt 78 26	Tl 81 27

Digit sum of atomic number

🟩 Only 1 naturally occuring isotope

🟦 Nearly 1 naturally occuring isotope (see page 13)

🟪 Atomic number is a prime number

The atomic numbers of the elements within a single group A1, A2, or A3 differ by an integer multiple of 3

The tripartition of the 81 = 3 × 27 = 3 × 3 × 3 × 3 stable chemical elements 2 / 5

Hypothesis 5a: The 3 groups A1, A2 and A3 which are presented on the previous page have a physical meaning and originate from the 3 states of an oscillation which can be called minus, plus, and zero (see also pages 18, 73, and 74)

- Group A1 may be called or considered as the "minus group" because it comprises (3 × 3 × 3 = 27) - 1 stable elements = 26 stable elements.
  Note: The two empty boxes with number 15 and 21 (see previous page) are not counted because they represent the two unstable elements Tc 43 and Pm 61, respectively
- Group A2 may be called or considered as the "plus group" because it comprises (3 × 3 × 3 = 27) + 1 stable elements = 28 stable elements
- Group A3 may be called or considered as the "zero group" because it comprises 3 × 3 × 3 = 27 stable elements

The atomic numbers of any chemical elements which belong exclusively to group A1 (minus) or group A2 (plus) or group A3 (zero) differ always by $3k$ whereby k is an integer, i.e. $k = 1, 2, 3, 4, \ldots$

The tripartition of the 81 = 3 × 27 = 3 × 3 × 3 × 3 stable chemical elements 3 / 5

Hypothesis 5b: The tripartition of the chemical elements can be used in various ways to obtain a selection or set of specific elements which could favor or enable special physical effects when they are used as components of a material, system, subsystem, or process. Of course, the generation of special physical effects requires another specific features of the corresponding material, system, subsystem, or process

On the following pages the hypotheses 5c, 5d, 7a, and 7b present some specific ways to obtain special selections or sets of chemical elements ...

The tripartition of the 81 = 3 × 27 = 3 × 3 × 3 × 3 stable chemical elements 4 / 5

Hypothesis 5c: The creation of special physical effects is favored or enabled when a material, system, subsystem, or process is constituted of chemical elements which belong only or mainly to group A1 (minus) <u>or</u> group A2 (plus) <u>or</u> group A3 (zero). In this case the atomic numbers of the corresponding elements differ always or mainly by $3k$ whereby k is an integer, i.e. $k = 1, 2, 3, 4, \ldots$ This may be considered as a scenario which comprises in a pronounced manner the presence of the number 3.
For $3k = 3^m$ ($m = 1, 2, 3$ or 4) such as $3k = 3 \times 3 \times 3 = 27$ the presence of the number 3 is once more enhanced. Therefore we suppose in this case an once more enhanced potential for the occurence of special physical effects

Of course, the generation of special physical effects requires another specific features of the corresponding material, system, subsystem, or process

The tripartition of the 81 = 3 × 27 = 3 × 3 × 3 × 3 stable chemical elements 5 / 5

Hypothesis 5d: The creation of special physical effects is favored or enabled when a material, system, subsystem, or process comprises chemical elements from all three groups, i.e.
at least 1 element belongs to group A1 (minus),
at least 1 element belongs to group A2 (plus), and
at least 1 element belongs to group A3 (zero).
This may be considered as a scenario which comprises in a pronounced manner the presence of all 3 aspects of an oscillation, namely minus, plus, and zero

Of course, the generation of special physical effects requires another specific features of the corresponding material, system, subsystem, or process

The tripartition of the 81 = 3 × 3 × 3 × 3 stable chemical elements and high-T_c superconductors

Among the presently known superconducting materials the highest superconducting transition temperatures T_c under ambient pressure are achieved by layered oxides which contain copper (Cu), oxygen (O) and other elements. Examples are

Compound	T_c (K)
$La_{1.85}Ba_{0.15}CuO_4$	30
$YBa_2Cu_3O_{7-\delta}$	92
$Bi_2Sr_2Ca_2Cu_3O_{10}$	110
$(Ba,Sr)CuO_2$	90
$(Sr,Ca)_5Cu_4O_{10}$	70
$Hg_{0.8}Tl_{0.2}Ba_2Ca_2Cu_3O_{8+\delta}$	138

For references see for example

- https://www.nobelprize.org/uploads/2018/06/bednorz-muller-lecture.pdf
- http://hyperphysics.phy-astr.gsu.edu/hbase/solids/hitc.html
- https://novam-research.com/resources/Research_Project_Room_Temperature_Superconductors.pdf
- P. Dai et al. , Physica C 243 (1995) 201 - 206

The tripartition of the 81 = $3 \times 3 \times 3 \times 3$ stable chemical elements and high-T_c superconductors

Evidence for high-T_c superconductivity in $WO_{2.9}$ and the system Na – W – O

Superconducting islands with $T_c \approx 90$ K on the surface of Na - doped WO_3

S. Reich et al., The European Physical Journal B 9 (1999) 1 • A. Shengelaya et al., The European Physical Journal B 12 (1999) 13 • S. Reich et al., Journal of Superconductivity 13 (2000) 855

- Strong experimental evidence for high-T_c superconductivity without Cu
- In spite of many efforts the superconducting phase could not be identified

Indications for filamentary superconductivity - which implies a small volume fraction - with $T_c = 80$ K in $WO_{2.9}$ and $T_c = 94$ K in Li-intercalated $WO_{2.9}$

A. Shengelaya, K. Conder, and K. A. Müller, Journal of Superconductivity and Novel Magnetism 33 (2020) 301

WO_3 (W^{6+}/ $5d^0$):
Antiferroelectric insulator with $T_c \approx 1000$ K and distorted ReO_3 type crystal structure which can be considered as distorted perovskite structure ABO_3 with absent A

$WO_{2.9}$ ($W^{5.8+}$/ $5d^{0.2}$):
Conducting Magneli phase $W_{20}O_{58}$ with mixed valence W^{6+} / $5d^0$ and W^{5+} / $5d^1$

The tripartition of the 81 = 3 × 3 × 3 × 3 stable chemical elements and high-T_c superconductors

3 / 4

Observation 6:

The number of chemical elements per formula unit of all Cu-O-based superconductors are predominantly elements from group A2 (see page 22) such as O 8, Cu 29, Sr 38 and Ba 56

Example: $YBa_2Cu_3O_{7-\delta}$: $2 \times Ba + 3 \times Cu + (7 - \delta) \times O = (12 - \delta)$ elements from group A2 and 1 × Y = 1 element from group A3

We note that the atomic number of the essential element Cu is a prime number, namely 29

The elements Na, W, and O of the unidentified superconducting phase in Na-doped WO_3 as well as W and O in $WO_{2.9}$ are all from group A2 (see page 22)

Hypothesis 6:

This is not accidental and related to the hypothesis 7a which is presented on page 31

The tripartition of the 81 = 3 × 3 × 3 × 3 stable chemical elements and high-T_c superconductors

4 / 4

High-T_c superconductivity up to about 250 K under high pressure

The previous and the following pages refer to superconductivity under normal or ambient pressure. On page 27 the established superconducting transition temperature T_c = 138 K is specified. However, it should be mentioned that higher T_c's are reported for materials which were put and studied under high pressure.

- Under a pressure of about 90 GPa H_2S transforms into a metal. At about 140 GPa it becomes superconducting with $T_c \approx 200$ K. Probably H_2S decomposes under high pressure and the phase responsible for high-T_c superconductivity is possibly H_3S

  A. P. Drozdov et al. , Nature 523 (2015) 73 – 76

- For LaH_{10} under a pressure of about 170 GPa the reported T_c is about 250 K

  A. P. Drozdov et al. , Nature 569 (2019) 528 – 531

Hypothesis 7a (the following is a more specific version of hypothesis 5c which is presented on page 25):

The creation of high-T_c superconductivity, especially at room temperature, is favored or enabled by a special material that comprises only or mainly chemical elements from group A1 (minus) or group A2 (plus) or group A3 (zero), i.e. their atomic numbers differ always or mainly by $3k$ whereby is k an integer, i.e. $k = 1, 2, 3, 4, \ldots$ This may be considered as a scenario which comprises in a pronounced manner the presence of the number 3

Of course, the creation of superconductivity at room temperature requires another special features of the material

The tripartition of the 81 = 3 × 3 × 3 × 3 stable chemical elements, high-T_c superconductors, and the search for room temperature superconductors

Hypothesis 7b (the following is a more specific version of hypothesis 5d which is presented on page 26):

The creation of high-T_c superconductivity, especially at room temperature, is favored or enabled by a special material that comprises chemical elements from all three groups, i.e.
at least 1 element belongs to group A1 (minus),
at least 1 element belongs to group A2 (plus), and
at least 1 element belongs to group A3 (zero).
This may be considered as a scenario which comprises in a pronounced manner the presence of all 3 aspects of an oscillation, namely minus, plus, and zero

Of course, the creation of superconductivity at room temperature requires another special features of the material

The tripartition of the 81 = 3 × 3 × 3 × 3 stable chemical elements, high-T_c superconductors, and the search for room temperature superconductors

3 / 3

The hypothesis 7a or 7b can be used to isolate chemical compositions which might favor or enable the creation of superconductivity at room temperature

Example: Oxides of the type $A_nB_nO_{3n+2} = ABO_x$. Some of their specific features suggest that they might have a potential to create room temperature superconductors. For more information we refer to two presentations which can be downloaded via the following links:

https://novam-research.com/resources/Research_Project_Room_Temperature_Superconductors.pdf

https://dx.doi.org/10.3929/ethz-b-000424221

Here hypothesis 7a can be applied only to group A2 (see page 22) because in this example the considered materials are oxides and O (oxygen) belongs to group A2

Note: A possible view of the transition temperatures of superconductors and potential room temperature superconductors from a Global Scaling point of view is presented on page 58

The tripartition of the 81 = 3 × 3 × 3 × 3 stable chemical elements and novel Ni-H/LENR-based energy technologies

1 / 2

Among entirely novel and environmentally friendly energy technologies are techniques which are based on so-called Low Energy Nuclear Reactions (LENR). For example, the so-called ECAT power plants generate large amounts of usable energy or power from small amounts of H (hydrogen) and special Ni (nickel) powder. The two elements H 1 and Ni 28 seem to be very efficient for LENR-based processes. For further information about the ECAT technology and ECAT power plants see

- https://ecat.com
- https://e-catworld.com
- A brief introduction and summary about the ECAT technology from November 2015: https://novam-research.com/resources/ECAT.pdf
- Information document about entirely novel and environmentally friendly energy technologies: https://novam-research.com/resources/information-document.pdf

The tripartition of the 81 = 3 × 3 × 3 × 3 stable chemical elements and novel Ni-H/LENR-based energy technologies

Observation 8:

The elements H 1 and Ni 28 belong both to group A1 (see page 22). Furthermore, the difference of their atomic numbers is $28 - 1 = 27 = 3 \times 3 \times 3 = 3^3$, i.e. the presence of the number 3 is striking

Hypothesis 8:

The high efficiency of the elements H 1 and Ni 28 at LENR-based processes is related to the tripartition of the chemical elements, hypothesis 5c and the potential effects of the presence of the number 3 (see pages 18, 22, and 25)

The tripartition of the 81 = 3 × 3 × 3 × 3 stable chemical elements and multiferroic materials

So-called multiferroic materials or multiferroics are materials which are simultaneously (anti)ferroelectric and (anti)ferromagnetic. Most multiferroic materials display also a coupling between ferrroelectric and magnetic properties, i.e. electrical quantities can be switched by magnetic quantities and vice versa.

The number of the presently known multiferroics such as $YMnO_3$, $DyMnO_{3-\delta}$ ($\delta > 0$) , $TbMnO_3$, $MnWO_4$, $BaNiF_4$, and CuO is relatively small and in most cases the (anti)ferromagnetic transition temperature $T_{C\,M}$ or (anti)ferroelectric transition temperature $T_{C\,FE}$ is below room temperature. There are also multiferroic thin film heterostructures such as $(LuFeO_3)_9$ / $(LuFe_2O_4)_1$

The tripartition of the 81 = 3 × 3 × 3 × 3 stable chemical elements and multiferroic materials

Examples of room temperature multiferroics

- $BiFeO_3$: Its antiferromagnetic and ferroelectric transition temperature is $T_{C\,M} \approx 650$ K and $T_{C\,FE} \approx 1100$ K, respectively. See, for example, https://en.wikipedia.org/wiki/Bismuth_ferrite

- ε - Fe_2O_3 : Thin films of the so-called epsilon phase of Fe_2O_3 are ferrimagnetic and ferroelectric at room temperature: M. Gich et al , Advanced Materials 26 (2014) 4645 - 4652 and https://arxiv.org/abs/1405.4909

- Thin film heterostructures of the type hexagonal $(LuFeO_3)_9$ / hexagonal $(LuFe_2O_4)_1$ are ferrimagnetic with $T_{C\,M} = 281$ K and ferroelectric with $T_{C\,FE} > 700$ K: J. A. Mundy et al , Nature 537 (2016) 523 - 527

The tripartition of the 81 = 3 × 3 × 3 × 3 stable chemical elements and multiferroic materials

3 / 3

Interestingly, the chemical elements Bi 83, Fe 26 and O 8 of $BiFeO_3$, Fe 26 and O 8 of ε - Fe_2O_3 , and Lu 71, Fe 26, and O 8 of $(LuFeO_3)_9$ / $(LuFe_2O_4)_1$ belong all to group A2 (see page 22). Therefore room temperature multiferroics are possibly related to the tripartition of the chemical elements and hypothesis 5c
(see pages 22 and 25)

Further references about multiferroics:

- N. A. Hill: Why there are so few magnetic ferroelectrics ?
  The Journal of Physical Chemistry B 104 (2000) 6694 - 6709
- N. A. Spaldin, S.-W. Cheong, and R. Ramesh:
  Multiferroics: Past, present, and future. Physics Today 63 (2010) 38 - 43
- S. Dong et al: Multiferroic materials and magnetoelectric physics: symmetry, entanglement, excitation, and topology. Advances in Physics 64 (2015) 519 - 629 and https://arxiv.org/abs/1512.05372

Extensions of the tripartition of the chemical elements

- The tripartition can also be applied to all chemical elements including the unstable elements. The unstable elements Tc 43 and Pm 61 belong to group A1 when they are taken into account. On page 22 the empty boxes with number 15 and 21 in group A1 represent the unstable elements Tc 43 and Pm 61, respectively

- We assume that the tripartition can be extended to each of the 3 groups A1, A2, and A3 which are presented on page 22 . For example, the 3 columns of the “minus group“ A1 can be considered as a sub-tripartition:

  Column 1 represents the “minus sub-group“ of the “minus group“ A1

  Column 2 represents the “plus sub-group“ of the “minus group“ A1

  Column 3 represents the “zero sub-group“ of the “minus group“ A1

  Therefore on page 22 the three columns of each group A1, A2, and A3 are labeled by 1 (-) , 2 (+) , 3 (0) which indicates the sub-tripartition. Furthermore, we assume that the hypotheses 5a - 5d (see pages 23 - 26) can be applied also to the sub-tripartition

The 3 ferromagnetic elements Fe 26 (iron) , Co 27 (cobalt), and Ni 28 (nickel)

Observation 10a: Among the 81 = 3 × 3 × 3 × 3 stable elements are 3 elements which are clearly ferromagnetic at ambient temperature. These are Fe 26, Co 27, and Ni 28 * and they belong to the group A2(+) , A3 (+) , and A1(-) , respectively (see page 22). The presence of the number 3 is striking. The atomic number of Fe, Co, and Ni is 26, 27, and 28 which corresponds to the total number of stable elements of the group A1(-) , A3 (+) , and A2(+) , respectively. The magnetic transition temperatures or Curie temperatures T_c of Fe 26, Co 27, and Ni 28 are *

T_c (Fe 26) = 1043 K T_c (Co 27) = 1388 K T_c (Ni 28) = 627 K

Observation 10b: Co has the highest Curie temperature T_c among all known ferromagnetic elements and compounds *. The atomic number of Co is $27 = 3 \times 3 \times 3 = 3^3$, i.e. the presence of the number 3 is striking. Furthermore, Co has only 1 naturally occuring isotope (see e.g. page 22)

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* See e.g. http://hyperphysics.phy-astr.gsu.edu/hbase/tables/curie.html
and https://en.wikipedia.org/wiki/Ferromagnetism

The 3 ferromagnetic elements Fe 26 (iron) , Co 27 (cobalt), and Ni 28 (nickel)

Observation 10c: Fe and Co are the ferromagnetic elements with the highest Curie temperatures T_c . In both groups A2 and A3, see page 22 , Fe and Co are located in column 3 (0) - see also page 39 - and at the position or box number 9 = 3 × 3, i.e. the presence of the number 3 is striking. In group A1 the element Ni is loacted in column 1(-) and at the position or box number 10, see page 22 , and the T_c of Ni is significantly smaller than that of Fe and Co

Hypothesis 10: The features described in observations 10a - 10c are not accidental but related to the number 3 and the tripartition of the chemical elements

Appendix 1 – Global Scaling and the derivation of the tripartition of the chemical elements

Appendix 1 - 1	Introduction into Global Scaling
Appendix 1 - 2	Derivation of the tripartition of the chemical elements by Global Scaling
Appendix 1 - 3	Global Scaling - More about the Fundamental Fractal and examples of open questions

Appendix 1 - 1

Introduction into Global Scaling ...

What is Global Scaling ?

Global Scaling was developed by Harmut Mueller. It represents a holistic approach in science and comprises significant insights into the universe, nature, life, and many physical and scientific topics.

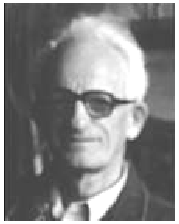
The following statements about / from Global Scaling are based on

- the author‘s participation in an overall 13 - day course in Global Scaling in 2005 lectured by Hartmut Mueller nearby Munich in Germany
- a German-language introduction into Global Scaling (1 MB pdf, 25 pages):
  https://www.novam-research.com/resources/Global-Scaling_Einfuehrung_V-2-dot-0_Maerz-2009.pdf

  an English version of this introduction (1 MB pdf, 23 pages):
  https://www.novam-research.com/resources/Global-Scaling_Introduction_V-2-dot-0_March-2009.pdf

Further information: Global Scaling website https://www.interscalar.com . A Global Scaling book from Hartmut Mueller (2018, New Heritage Publishers, ISBN 978-0-9981894-0-6) can be downloaded as pdf free of charge via the following link (file size 11 MB): http://www.ptep-online.com/books/muller2018.pdf . Various information, links, and papers are listed in https://novam-research.com/global-scaling.php

What is Global Scaling ?



Simon E. Shnoll

Hartmut Mueller

- Global Scaling rests upon the results of comprehensive studies, e.g. by Prof. Simon E. Shnoll et al, of frequency distributions of many different physical, chemical and biological processes and phenomena such as radioactive decay and body masses of biological species. These studies revealed the existence of formerly unexplored physical laws and effects

- Global Scaling was developed by Hartmut Mueller

- Some keywords of Global Scaling:
  - scale invariance • logarithm • fractal • fractal structures
  - Fundamental Fractal • continued fractions • (eigen) oscillations
  - nodes • gaps • resonance • vacuum resonance • synchronicity
  - frequency distributions • probability • non-linear and fractal course of time

Global Scaling – Some essential statements or hypotheses

- In the universe / nature / vacuum there is an everywhere present background field in form of oscillations (standing waves) which have a significant influence on the constitution of all processes, structures and systems in the universe, nature, and the design of workable and reliable technology

- Particles such as protons and electrons are considered as vacuum resonances, i.e. they are special oscillation or resonance states of the physical vacuum

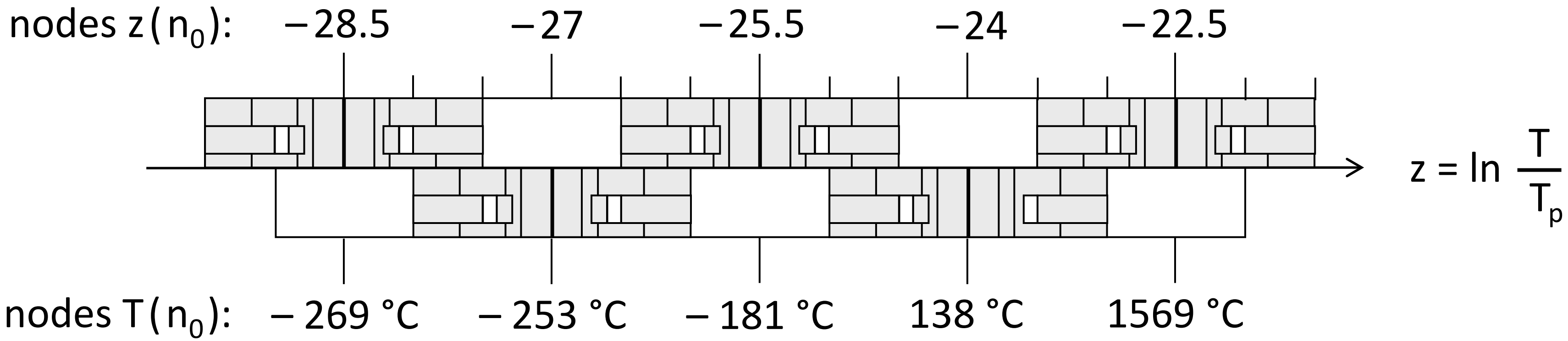
- In the universe there is a synchronicity in which all particles and matter are intimately involved. There are indications that this can be revealed, for example, by noise spectra of electronic components which show at different locations simultaneously the same fine structure

- Every part of the universe, e.g. an atom, comprises the entire information of the universe

Global Scaling – Another essential statement or hypothesis

On every physical scale – such as length, mass, time, frequency, temperature, amperage, and dimensionless numbers in terms of sets or ratios – there is an universal distribution of certain positions and zones which have a special meaning and a potential physical effect, e.g. a high or low resonance or oscillation capability. On a logarithmic scale this universal distribution is called the Fundamental Fractal (FF). If, which and how many of these positions and zones actually unfold their corresponding effects depends on the details of the specific system or process and on external conditions.

FF example: Simplified sketch of a section of the **Fundamental Temperature Fractal** on the level n_0 , i.e. a spectrum of discrete values on the logarithmic z and linear T axis (T = temperature , T_p = assumed calibration unit = 1.08882×10^{13} K):



Global Scaling – More about the Fundamental Fractal (on the level n_0 and n_1)

The Fundamental Fractal is an universal distribution or pattern of certain positions and zones which have – on every physical scale – specific meanings and potential physical effects

Let`s consider a quantity x on a logarithmic axis z: $z = \ln \frac{x}{x_c}$

x = physical quantity or dimensionless number (ratio or set) under consideration

x_c = calibration unit of the considered physical scale such as length or mass

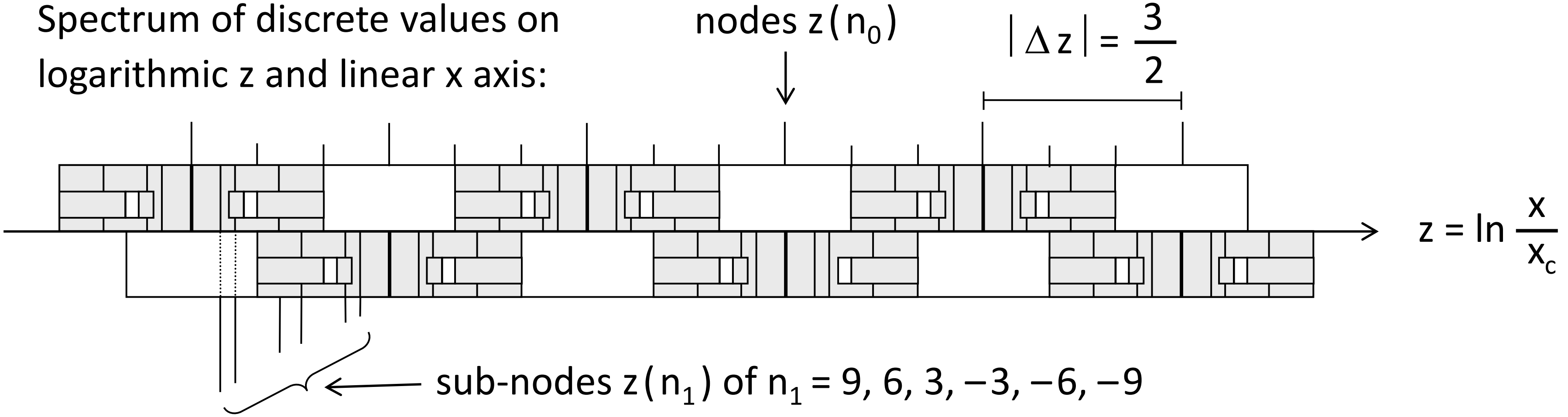
The positions of so-called nodes and sub-nodes – one of their potential effects is a high resonance or oscillation capability – are generated by a special continued fraction:

$$\boxed{z = \ln \frac{x}{x_c} = \frac{3n_0}{2} + \cfrac{2}{n_1 + \cfrac{2}{n_2 + \ddots}}}$$

$n_0 = \pm k \quad n_1 = \pm 3j \quad k, j = 0, 1, 2, 3 \ldots$

range of nodes and sub-nodes: $n_0 \pm 1$, $n_1 \pm 1$

Spectrum of discrete values on logarithmic z and linear x axis:



nodes $z(n_0)$

$|\Delta z| = \frac{3}{2}$

$z = \ln \frac{x}{x_c}$

sub-nodes $z(n_1)$ of $n_1 = 9, 6, 3, -3, -6, -9$

Global Scaling – Miscellaneous notes

- The continued fraction which is presented on the previous page comprises a striking presence of the number 3, i.e. Global Scaling implies a marked presence of the number 3

- Global Scaling phenomena are a feature of complex and open systems or processes and are less or not at all apparent in “simple and isolated“ systems or processes

- Global Scaling may allow an access to complex tasks / problems / systems and may be applied in many areas such as engineering, physics, biology, (holistic) medicine, architecture, economy, optimization, prognosis …

- A Global Scaling analysis of an existing system or process may lead to a deepened understanding of its specific parameters, features and behavior

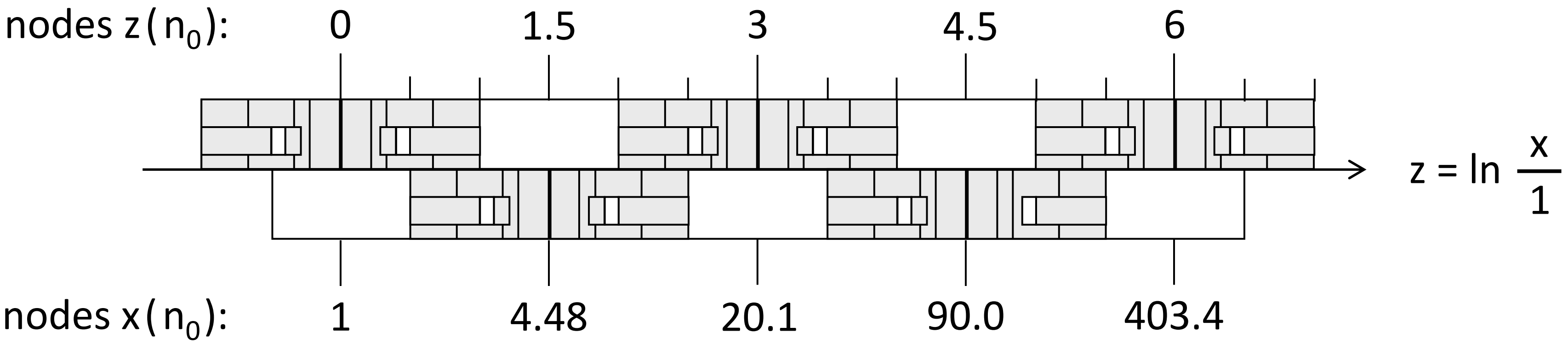
Global Scaling – How it can be applied

Brief description of the approach when Global Scaling is applied with respect to the consideration or modification of an existing system or the creation of a new system:

If Global Scaling is assumed to be relevant for the corresponding task / problem / system, then consider the positions of its associated physical quantities and numbers in the corresponding Fundamental Fractal(s) (FF) → Identify the adjustable and non-adjustable quantities or parameters of the corresponding task / problem / system → To obtain a certain desirable result it is necessary to get an idea, hypothesis or intuition at which positions in the Fundamental Fractal(s) (FF) the adjustable quantities or parameters have to be placed

Note: For any task or question in which Global Scaling is applied, "conventional" knowledge, experiences, results and ideas play an equal role

FF example: Simplified sketch of a section of the **Fundamental Number Fractal** on the level n_0 (number in terms of set or ratio), i.e. a spectrum of discrete values on the logarithmic z and linear x axis (x = number , 1 = assumed calibration unit):



Appendix 1 - 2

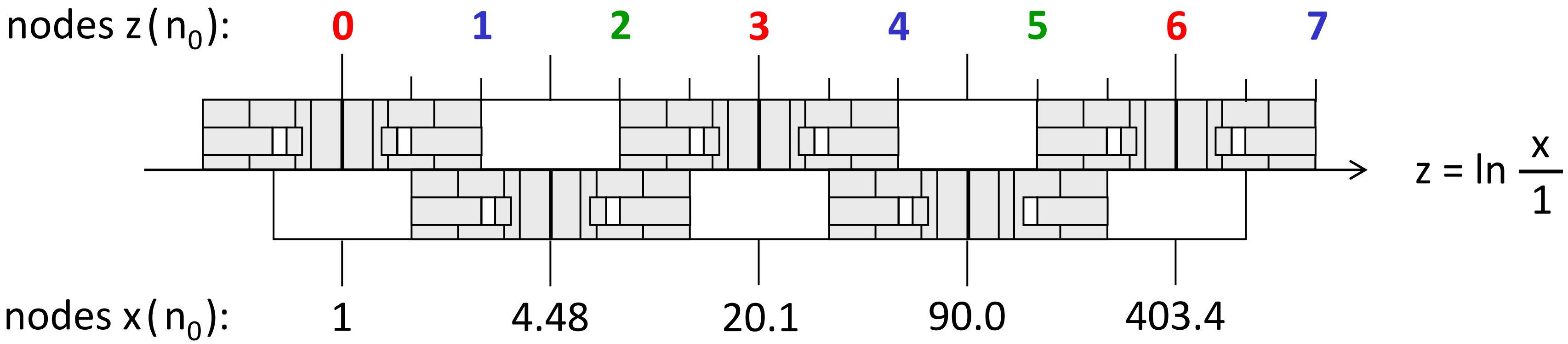
Derivation of the tripartition of the chemical elements by Global Scaling ...

Derivation of the tripartition of the chemical elements by Global Scaling 1 / 4

The author of this presentation participated in 2005 in an overall 13 - day course in Global Scaling which was lectured by Hartmut Mueller nearby Munich in Germany. During that course the author of this presentation did ask Hartmut Mueller how to consider the atomic numbers of the chemical elements from the Global Scaling point of view.
The answer from Hartmut Mueller was the following:
“The atomic numbers of the chemical elements have to be considered as numbers which are already logarithmized.“
His answer was surprising because in Global Scaling one takes usually first and foremost the logarithm of the quantity under consideration. Nevertheless, the author of this presentation agrees intuitively with his statement and has explored what it implies (even if it remains an open question why the atomic numbers should be considered in this way) ...

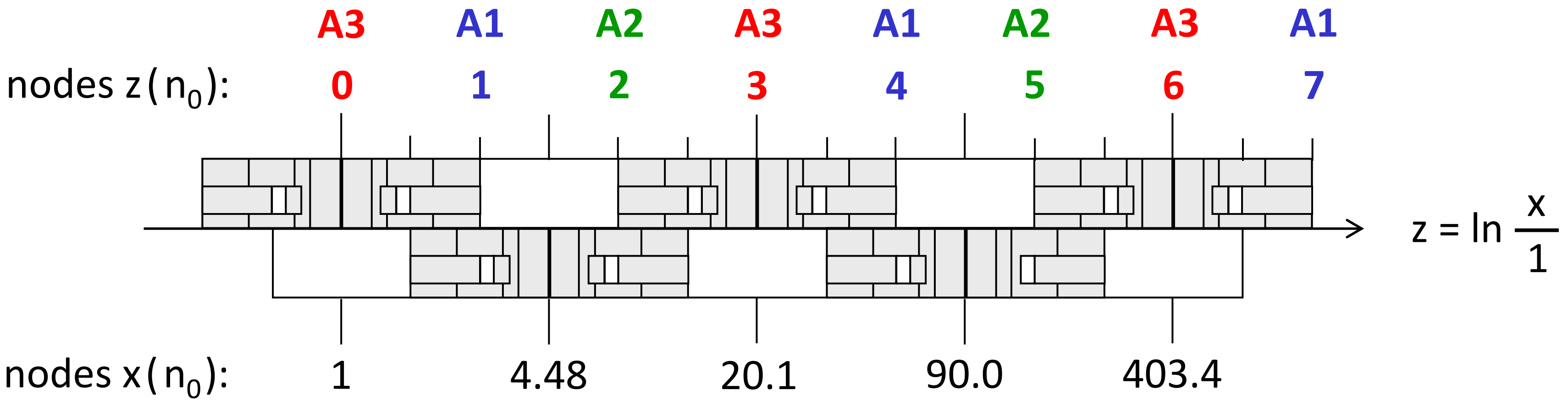
Derivation of the tripartition of the chemical elements by Global Scaling 2 / 4

Let`s consider a section of the Fundamental Number Fractal which is also shown on page 50:



The statement or hypothesis that the atomic numbers have to be considered as numbers which are already logarithmized means that the node positions $z(n_0) = 1, 2, 3, 4, \ldots$ correspond to the atomic numbers of the chemical elements. On the logarithmic z axis the basic spectrum of the Fundamental Fractal repeats itself every $3/2 = 1.5$ units

Derivation of the tripartition of the chemical elements by Global Scaling 3 / 4

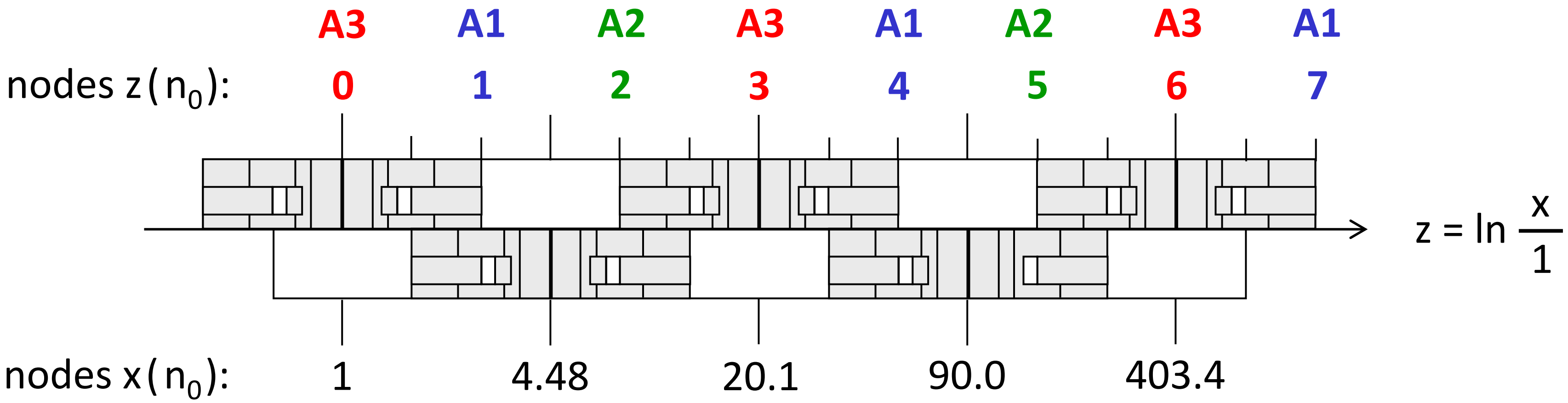


The numbers which are equal to the node positions $z(n_0)$ = **1 , 4 , 7 , 10 , ...** are of course different numbers but they carry also common features because they are located at an equivalent position within the repetitive basic spectrum of the Fundamental Fractal. We call them positions or numbers of the type **A1**

Similarly, the numbers which correspond to the node positions $z(n_0)$ = **2 , 5 , 8 , 11 , ...** are of course different numbers but they carry also common features because they are located at an equivalent position within the repetitive basic spectrum of the Fundamental Fractal. We call them positions or numbers of the type **A2**

Likewise, the numbers which correspond to the node positions $z(n_0)$ = **0 , 3 , 6 , 9 , 12 , ...** are of course different numbers but they carry also common features because they are located at an equivalent position within the repetitive basic spectrum of the Fundamental Fractal. We call them positions or numbers of the type **A3**

Derivation of the tripartition of the chemical elements by Global Scaling 4 / 4



Thus we have found the following tripartion:

Group **A1** → **1 , 4 , 7 , 10 , ...**

Group **A2** → **2 , 5 , 8 , 11 , ...**

Group **A3** → **0 , 3 , 6 , 9 , 12 , ...**

If we consider these whole numbers (apart from 0) as the atomic numbers of the chemical elements, i.e. the number of protons or electrons per atom, then we obtain the tripartition of the chemical elements which is presented on page 22

Appendix 1 - 3

Global Scaling - More about the Fundamental Fractal and examples of open questions ...

Global Scaling – A section of the Fundamental Time Fractal on the level n_0

$$z = \ln \frac{t}{\tau_p} = \frac{3\,n_0}{2} \qquad n_0 = 0\,,\,\pm 1\,,\,\pm 2\,,\,\pm 3\,\ldots$$

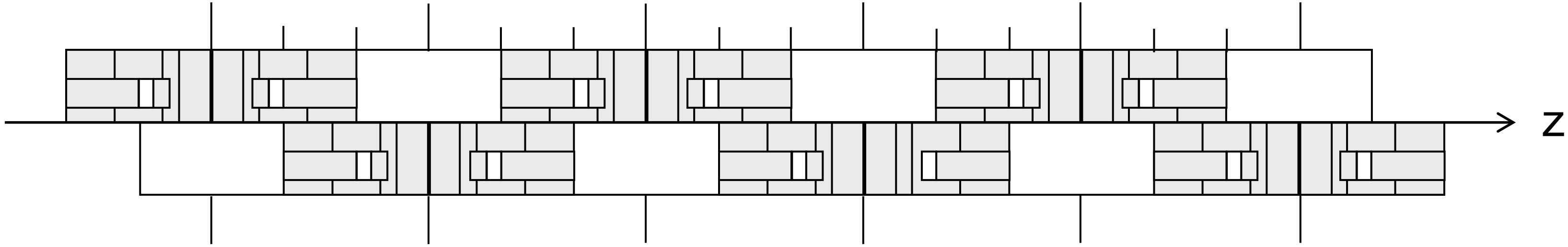
t = time, e.g. elapsed time after the creation of an object or birth of a human body / baby

$\tau_p = 1 / f_p = \lambda_p / c = 7.01515 \times 10^{-25}$ s = assumed (universal) calibration unit for the time

f_p = proton frequency , $\lambda_p = h / (2\pi c\, m_p)$ = reduced Compton wave length of the proton

Node positions $z(n_0)$ or $t(n_0)$ in the time fractal mark with high probability important points of change in the course of a process, independent of its nature

nodes $z(n_0)$: 69 70.5 72 73.5 75 76.5



nodes $t(n_0)$: 7.5 days 34 days 5 months 1.9 years 8.3 years 37 years

Examples of their relevance:

Observed facts from our world

At the age of 7 days a fertilized egg nests itself in the uterus

Statistical maxima of product failure

Based on statistical results life insurances distinguish between people below and above 37 years

Highest age of Stone Age men

Global Scaling – A section of the Fundamental Temperature Fractal on the level n_0 and a potential view of the transition temperatures of superconductors

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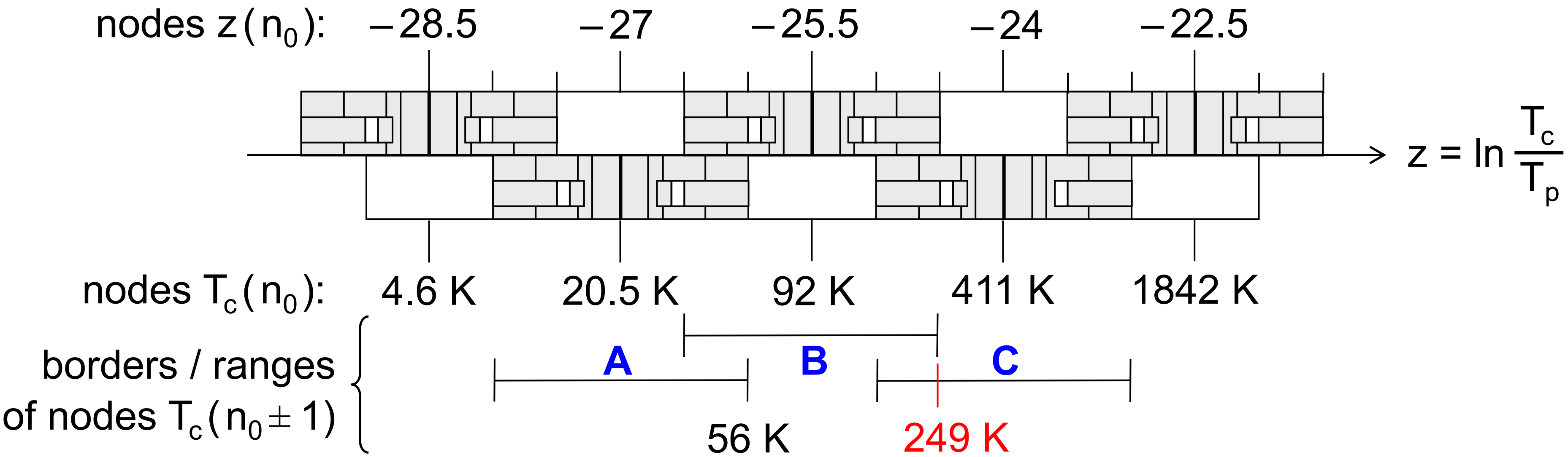
$$z = \ln \frac{T_c}{T_p} = \frac{3 n_0}{2}$$

$n_0 = 0, \pm 1, \pm 2, \pm 3 \ldots$, T_c = transition temperature [K], $T_p = m_p c^2 / k = 1.08882 \times 10^{13}$ K = assumed calibration unit for temperatures

One of some potential effects of node positions $z(n_0)$ or $T_c(n_0)$: Event attractor

One of some potential effects of borders $z(n_0 \pm 1)$ or $T_c(n_0 \pm 1)$ of nodes: Development limit



A: Classical superconductors such as Nb_3Ge or MgB_2, typical (max.) T_c's ≈ 20 (40) K

B: High-T_c superconductors based on Cu and O such as $YBa_2Cu_3O_{7-\delta}$, typical T_c's about 100 K. Several reports with indications for $T_c \approx 240$ K but unverified because difficult to reproduce: 249 K upper T_c limit of Cu-O-based superconductors ?

C: T_c's of next generation superconductors ? Typical T_c's about 400 K ?

Global Scaling – A representation of the Fundamental Fractal on the level n_0 and n_1

$$z = \ln\frac{x}{x_c} = \frac{3}{2}n_0 + \cfrac{2}{n_1 + \cfrac{2}{n_2 + \ddots}} \qquad n_0 = \pm k \qquad n_1 = \pm 3j \qquad k, j = 0, 1, 2, 3 \ldots$$

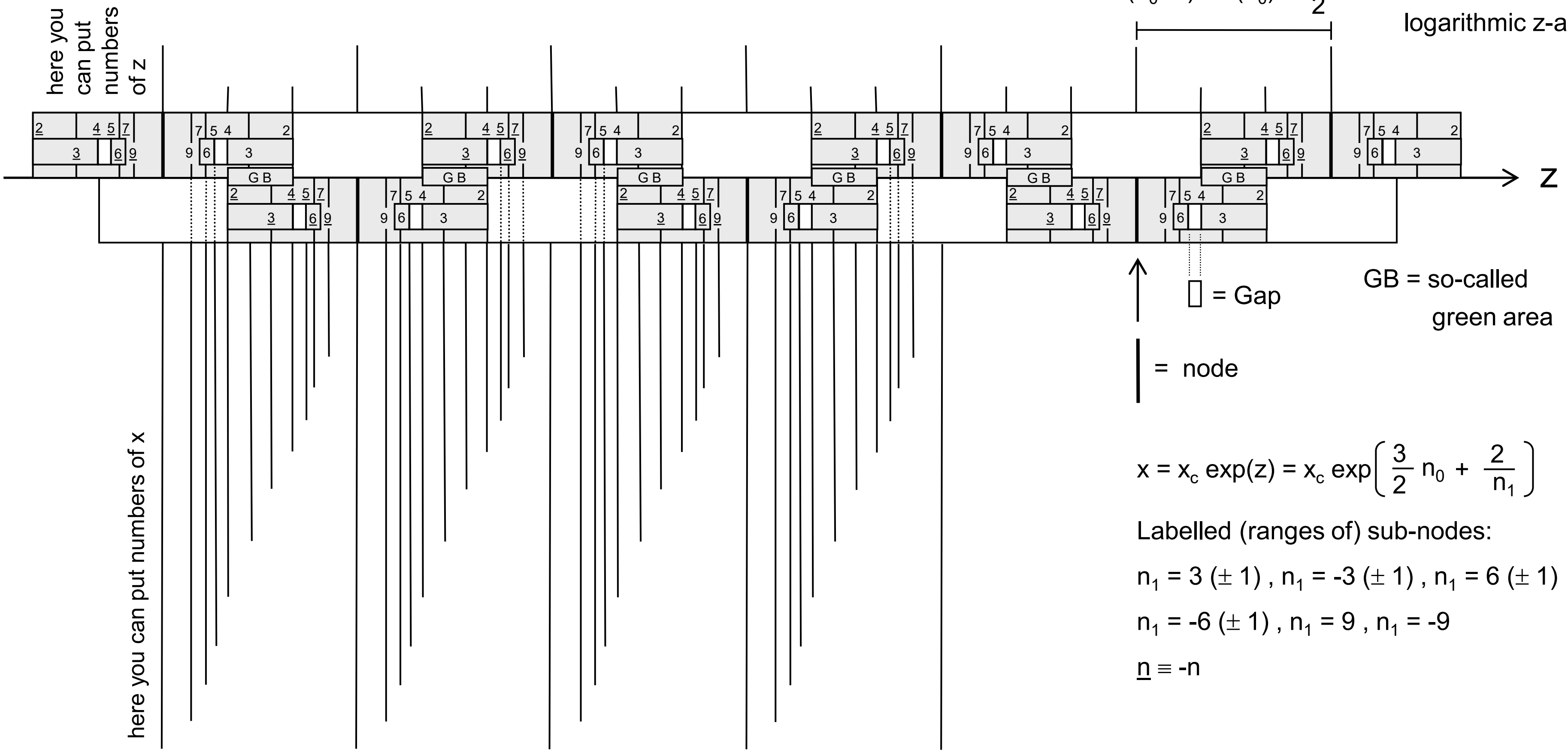
so-called nodes: n_0 , $z(n_0)$, $x(n_0)$

so-called sub-nodes: n_1 , $z(n_1)$, $x(n_1)$

x = physical quantity or number (ratio or set) under consideration x_c = calibration unit of the considered physical scale such as length

For further information see https://www.novam-research.com/resources/Global-Scaling_Introduction_V-2-dot-0_March-2009.pdf (in English), or https://www.novam-research.com/resources/Global-Scaling_Einfuehrung_V-2-dot-0_Maerz-2009.pdf (in German) and the previous pages about Global Scaling in this presentation

$z(n_0+1) - z(n_0) = \frac{3}{2}$ = distance of nodes on logarithmic z-axis



▯ = Gap

GB = so-called green area

| = node

$$x = x_c \exp(z) = x_c \exp\left(\frac{3}{2}n_0 + \frac{2}{n_1}\right)$$

Labelled (ranges of) sub-nodes:

$n_1 = 3\ (\pm 1)$, $n_1 = \text{-}3\ (\pm 1)$, $n_1 = 6\ (\pm 1)$

$n_1 = \text{-}6\ (\pm 1)$, $n_1 = 9$, $n_1 = \text{-}9$

$\underline{n} \equiv \text{-}n$

Global Scaling – Examples of open questions

The following examples of open questions should be considered with respect to the following papers:

[1] https://www.novam-research.com/resources/Global-Scaling_Einfuehrung_V-2-dot-0_Maerz-2009.pdf
(in German, 1 MB pdf, 25 pages)

[2] https://www.novam-research.com/resources/Global-Scaling_Introduction_V-2-dot-0_March-2009.pdf
(in English, 1 MB pdf, 23 pages)

The papers [1] and [2] comprise for the Fundamental Fractal a list with calibration units which are mainly related to the properties of the proton

Further information about Global Scaling:

- Global Scaling website https://www.interscalar.com
- A Global Scaling book from Hartmut Mueller (2018, New Heritage Publishers, ISBN 978-0-9981894-0-6) can be downloaded as pdf free of charge via the following link (file size 11 MB): http://www.ptep-online.com/books/muller2018.pdf
- Various information, links, and papers are listed in https://novam-research.com/global-scaling.php

Global Scaling – Examples of open questions

Some general questions:

- Does the Fundamental Fractal describe the (potential) effects of the everywhere present background field in an appropriate way and how universal is it ?
- Are the presently assumed calibration units appropriate and how universal are they ?
- Are the effects of the spin (intrinsic angular momentum of particles such as electrons or protons), intrinsic angular momentum of macroscopic objects such as the earth, and vortices included in or appropriately described by the Fundamental Fractal ?

Appropriate means if the Fundamental Fractal and the calibration units reflect or describe most appropriately the observed features of systems and processes in nature, biology, physics, universe, workable and reliable technology ...

- Is it possible to derive the Fundamental Fractal and the calibration units from a physical theory such as a specific type of unified field theory ?

Global Scaling – Examples of open questions

About the calibration units

If the concept of the Fundamental Fractal and associated calibration units is basically correct, then the calibration units are specified by the underlying physics of the so-called empty space, vacuum, or ether and its inherent oscillations. Then it can be assumed that the calibration units are readable from some features of some phenomena or physical appearances in nature and the universe, e.g. from something that is predominant and stable. The proton is a very stable elementary particle and the mass of the atoms is mainly given by the mass of the protons (the proton mass is 1836 times greater than that of the electron). The presently assumed calibration units are mainly quantities which are associated with the proton. For example, for masses the assumed (universal) calibration unit is the proton mass $m_p = 1.67262 \times 10^{-27}$ kg, for temperatures the assumed (universal) calibration unit is the so-called proton temperature $T_p = m_p c^2 / k = 1.0888 \times 10^{13}$ K, and for lengths the assumed (universal) calibration unit is $\lambda_p = h / (2 \pi c m_p) = 2.10309 \times 10^{-16}$ m which is the so-called reduced Compton wave length * of the proton.

Why just the reduced Compton wave length of the proton and not $h / (c m_p) = 1.32141 \times 10^{-15}$ m which is the usual Compton wave length of the proton ? Why the Compton wave length at all and not, for example, the radius or diameter of the proton ? Recently the electric charge radius of the proton was determined to 8.41×10^{-16} m, see e.g. https://www.psi.ch/en/media/our-research/proton-size-puzzle-reinforced . In comparison to masses, a well-defined and useful appearing calibration unit for lengths seems to be less obvious

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* The Compton wave length of a particle with rest mass m corresponds to the wave length of a photon whose energy is equal to the energy $m c^2$ of the rest mass m

Global Scaling – Examples of open questions

The calibration unit for the angular momentum and spin

The angular momentum **L** of a rigid body is defined by $\mathbf{L} = \mathrm{I}\boldsymbol{\omega}$ whereby I is the moment of inertia tensor and $\boldsymbol{\omega}$ the angular velocity of the body. The angular momentum **L** of a particle is defined by the vector product $\mathbf{L} = \mathbf{r} \times \mathbf{p}$ whereby **r** is the position vector of the particle and $\mathbf{p} = m\,\mathbf{v}$ is the momentum of the particle with mass m and velocity **v**. The intrinsic angular momentum of elementary particles such as the proton or electron is called spin. The physical unit of the angular momentum and spin is mass length^2 / time such as kg m^2 / s

When looking at the calibration units which are presented in references [1] and [2], see page 60 , then it appears suggestive to obtain a calibration unit for the angular momentum and spin, L_p , in the following way:

$L_p = m_p\, \lambda_p^2 / \tau_p = h / 2\pi = \hbar$ = reduced Planck constant $= 1.05457 \times 10^{-34}$ kg m^2 / s

whereby m_p is the proton mass, $\lambda_p = h / (2\, \pi\, c\, m_p)$ the so-called reduced Compton wave length of the proton, and $\tau_p = \lambda_p / c = h / (2\, \pi\, c^2\, m_p)$ the “proton time“

On the other hand, it is known that the proton is a spin 1 / 2 particle, i.e. its spin S_p is

$S_p = \hbar / 2 = 5.27286 \times 10^{-35}$ kg m^2 / s

Is L_p or S_p an appropriate calibration unit for the spin and the angular momentum ?

We suggest to consider S_p as an appropriate calibration unit because it reflects the actual spin of the proton

Global Scaling – Examples of open questions

The calibration unit for magnetic moments

The physical unit of the magnetic moment is energy / magnetic flux density such as J / T whereby $1\ \mathrm{J} = 1\ \mathrm{kg\ m^2 / s^2}$ and $1\ \mathrm{T}$ (Tesla) $= 1\ \mathrm{kg\ A^{-1}\ s^{-2}}$. The latter reflects the physical unit of the magnetic flux density, namely mass current^{-1} time^{-2}

When looking at the calibration units which are presented in references [1] and [2], see page 60 , then it appears suggestive to obtain a calibration unit for the magnetic moment, ν_p , in the following way:

$$\nu_p = E_p / (m_p\, I_p^{-1}\, \tau_p^{-2}) = e\, \hbar / m_p = 1.01016 \times 10^{-26}\ \mathrm{J / T}$$

whereby $E_p = m_p\, c^2$ is the proton energy, m_p the proton mass, $I_p = e / \tau_p$ the “proton current“, $\tau_p = \lambda_p / c = h / (2\, \pi\, c^2\, m_p)$ the “proton time“, and $e = 1.602176 \times 10^{-19}\ \mathrm{A\ s}$ the elementary charge

On the other hand, the experimentally determined magnetic moment of the proton, μ_p , is

$$\mu_p = 1.410607 \times 10^{-26}\ \mathrm{J / T}$$

Is ν_p or μ_p an appropriate calibration unit for the magnetic moment ? We suggest to consider μ_p as an appropriate calibration unit because it reflects the actual magnetic moment of the proton

Global Scaling – Examples of open questions

The calibration unit for magnetic fields

The physical unit of the magnetic field or magnetic flux density is mass current $^{-1}$ time $^{-2}$ such as kg A^{-1} s^{-2} = T (Tesla)

When looking at the calibration units which are presented in references [1] and [2], see page 60 , then it appears suggestive to obtain a calibration unit for the magnetic field, b_p , in the following way:

$$b_p = m_p \, I_p^{-1} \, \tau_p^{-2} = m_p^2 \, c^2 / (e \, \hbar) = 1.48816 \times 10^{16} \text{ T}$$

whereby c = 299792458 m / s is the speed of light. The other quantities are defined on the previous pages

- Is the quantity b_p really an appropriate calibration unit for the magnetic field ?
- Is it possible to obtain another calibration unit for the magnetic field, for example via $\mu_p = 1.410607 \times 10^{-26}$ J / T which is the experimentally determined magnetic moment of the proton ?

Global Scaling – Examples of open questions

About the calibration units

The following properties of the proton represent well-defined and experimentally determined quantities and therefore it seems to be obvious to consider them as well-defined and useful appearing calibration units for the corresponding physical scale:

- Proton mass: $m_p = 1.67262 \times 10^{-27}$ kg
- Electric charge of the proton (elementary charge): $e = 1.602176 \times 10^{-19}$ A s
- Spin (intrinsic angular momentum) of the proton:
  $S_p = \hbar / 2 = 5.27286 \times 10^{-35}$ J s
- Magnetic moment of the proton: $\mu_p = 1.410607 \times 10^{-26}$ J / T
- Rest mass energy of the proton: $E_p = m_p c^2 = 1.503276 \times 10^{-10}$ J

All other calibration units which are presented on the previous pages and in [1] and [2] on page 60 appear as “constructed“ values and raise the following questions:

- Are they really appropriate calibration units ? When we consider, for example, the Fundamental Time Fractal on page 57 , then the assumed calibration unit for the time, the “proton time“ $\tau_p = h / (2 \pi c^2 m_p)$, seems to be appropriate because the corresponding values in the Fundamental Fractal reflect observed facts from our world

- Is there a clear explanation why τ_p and other “constructed“ calibration units are appropriate ?

Global Scaling – Examples of open questions

The electron as potential provider of another set of calibration units

On the logarithmic z-axis the basic unit of the Fundamental Fractal repeats when z is displaced by $3k/2 = 1.5k$ whereby $k = 0, \pm 1, \pm 2, \pm 3 \ldots$ Thus, if we neglect the absolute position on the logarithmic z-axis, then a calibration unit x_c is equivalent to the following calibration units:

$x_c(k) = x_c \exp(1.5\,k)$ whereby $k = 0, \pm 1, \pm 2, \pm 3 \ldots$

It is well-known that the proton mass m_p is about 1836 times greater than the electron mass m_e:

$m_p = 1836.15\, m_e = e^{7.515}\, m_e = m_e \exp(1.5 \times 5 + 0.015)$!

Thus, if the proton mass m_p and the electron mass m_e are considered as useful appearing calibration units, then both generate almost the same positions within the basic unit of the Fundamental Fractal. On the logarithmic z-axis they differ only by 0.015 = 1.5 %, in fact not only for masses but also on other physical scales if the associated calibration unit is a “constructed“ quantity which comprises a mass such as the proton mass m_p in the numerator or denominator, see previous pages and references [1] and [2] on page 60 . Is the electron mass m_e or the proton mass m_p the more appropriate calibration unit ? A detailed study is necessary to answer this question

Appendix 2

Derivation of the
tripartition of the
chemical elements
by an assumed
special role
of the number 3 ...

Derivation of the tripartition by an assumed special role of the number 3 1 / 2

The tripartion of the chemical elements which is presented on page 22 can also be derived in the following way. Let`s consider the whole numbers

1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9 , 10 , 11 , 12 , ...

We assume that numbers have or carry specific intrinsic attributes. Let`s further assume that the numbers 1 , 2 , 3 represent a kind of basis period which generate for the corresponding numbers of subsequent periods related attributes, i.e.

- 1 , 4 , 7 , 10 , ... are of course different numbers but they have also common attributes which are related to those of the number 1
- 2 , 5 , 8 , 11 , ... are of course different numbers but they have also common attributes which are related to those of the number 2
- 3 , 6 , 9 , 12 , ... are of course different numbers but they have also common attributes which are related to those of the number 3

Such or a similar consideration of numbers is not new and was already described by other authors. For example by Michael Stelzner in his German-language book "Die Weltformel der Unsterblichkeit" (ISBN 3-922367-70-4, first edition 1996) and Dr. Peter Plichta in his German-language webpages http://www.plichta.de/plichta and http://www.plichta.de/plichta/vortrag-in-illmenau/gehalten-an-der-uni-illmenau-am-7-6-05

Derivation of the tripartition by an assumed special role of the number 3 2 / 2

The assumed special role of the number 3 is constituted by the three-part basis period 1 , 2 , 3 which is terminated or completed by the number 3. We speculate that the special role or meaning of the number 3 and the three numbers 1 , 2 , 3 originate from the 3 states of an oscillation which can be called minus, plus, and zero, see also pages 73 and 74

Let`s now consider the atomic numbers of the chemical elements, i.e. their number of protons or electrons per atom, in a way which is presented on the previous page:

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**...**
H	**He**	**Li**	**Be**	**B**	**C**	**N**	**O**	**F**	**Ne**	**Na**	**Mg**	**...**

The elements of **group 1** , **group 2** , **group 3** are of course different elements but they have also common attributes which are related to those of the numbers **1** , **2** , **3** , respectively. This corresponds to the tripartition of the chemical elements which is presented on page 22 and its derivation by Global Scaling whose final result is presented on page 55

The described considerations and assumptions also imply the hypothesis that numbers are not only abstract mathematical quantities but also physical quantities which are potentially able to cause physical effects (see appendix 4). Otherwise the tripartition of the chemical elements, for example, would be just a nice concept without any physical meaning, in contrast to the hypotheses 5a - 5d which are presented on pages 23 - 26

Appendix 3

Examples of the presence of the number 3 and hypotheses about its origin and special meaning ...

Examples of the presence of number 3

- The 3 aspects of time: Past - Present - Future
- We live in a world with 3 geometrical or spatial dimensions, the 3-dimensional space, or we perceive (only) 3 geometrical dimensions
- Chemical elements: There are 3 × 3 × 3 × 3 = 81 stable elements
- Citation from Buckminster Fuller: “Any polygon with more than 3 sides is unstable. Only the triangle is inherently stable. Any polyhedron bounded by polygonal faces with more than 3 sides is unstable. Only polyhedra bounded by triangular faces are inherently stable.”
- Elementary particles: Within the so-called quark model the protons and neutrons consist of 3 particles which are called quarks
- The trinity in religion / mysticism / metaphysics / spirituality:
    - The divine or the universe comprises 3 aspects which are, for example, named as follows: The Mother or Father - The Daughter or Son - The Holy Spirit
    - The 3 aspects of the human being: Body - Soul - Spirit
- Enneagram: The personalities of human beings can be divided into 3 x 3 = 9 main types
- The are many phrases which comprise the number 3, for example:
  All good things come in threes

Hypotheses about the origin and special meaning of the number 3 1 / 2

We speculate / assume that the presence or special meaning of the number 3 originates from the three states of an oscillation which can be called minus, zero and plus. Oscillations of various types are everywhere present and inherent in our world.

Quantum mechanical oscillation states are inherent in the atoms which are the buliding blocks of matter. The building blocks of the atoms are particles which are called electrons, protons and neutrons. These particles occupy only less than 0,1 % of the atomic volume, i.e. the atoms and thus all manifestations of matter consist more than 99,9 % of so-called empty space or vacuum ...

Hypotheses about the origin and special meaning of the number 3 2 / 2

Moreover, there are several theories which consider even all particles such as electrons and protons as oscillation states. For example, particles can be considered as special oscillation or vortex states of an everywhere present substratum which is called space, vacuum, or ether. For references, papers and links see for example

- The Electric Charge and Magnetization Distribution of the Nucleon: Evidence of a Subatomic Turing Wave Pattern, Paul A. LaViolette, published in the Int. Journal of General Systems 37 (6) (2008) 649 - 676: www.starburstfound.org/downloads/physics/nucleon.pdf
- https://novam-research.com/keppe.php (some citations of the new physics of Noberto Keppe)
- https://www.tewari.org
- Global Scaling, see pages 42 - 67
- www.kinkynature.com/ektheorie/indexframe.htm (Elementary Body Theory by Dirk Freyling)
- Quantum Gravity and the Holographic Mass, N. Haramein, Physical Review & Research International 3 (4) (2013) 270 - 292: www.sciencedomain.org/abstract/1298#.U3FRLPldVWs

Even established physics or quantum mechanics describes particles such as electrons or protons as waves or wave packets which implies the presence of oscillations

Appendix 4

Why are numbers possibly not only abstract mathematical quantities but also physical quantities which are potentially able to cause physical effects ...

Why are numbers possibly not only abstract mathematical quantities but also physical quantities which are potentially able to cause physical effects

The hypothesis that numbers are not only abstract mathematical quantities but also physical quantities which may under certain circumstances induce physical effects is, for example, supported by Global Scaling. The following considerations are formulated by the author of this presentation but their contents originate mainly from a 13 - day course about Global Scaling lectured by Hartmut Mueller in 2005 nearby Munich in Germany.

Let`s first consider which kinds of numbers are meant here. Global Scaling and its Fundamental Number Fractal (see appendix 1 - 1) implies that numbers in terms of sets or ratios may potentially be able to cause physical effects. The underlined statement indicates which kinds of numbers are meant here, namely ratios or the total number of objects of a set of objects. The latter is also called cardinal number which is related to counting, the question “How many ?“, and quantity. A cardinal number has to be distinguished from a so-called ordinal number which describes the numerical position of an object such as first or 1 , second or 2 , third or 3 , etc.

Why are numbers possibly not only abstract mathematical quantities but also physical quantities which are potentially able to cause physical effects

As described on pages 73 and 74 our world is possibly created by an everyhere present and oscillating substratum which is called space, vacuum, or ether. If we assume that the substratum itself is homogenous, then the oscillations create also something that can be called discriminability, i.e. separate or single physical states such as wave forms or particles * which can be distinguished from each other. This discriminability and the resulting countability is the prerequisite for the concept of numbers. This consideration implies that numbers are also physical quantities because they are a consequence of oscillations.

Let`s consider any physical system or process and imagine that we change some of its numbers, e.g. the number of particles or the number of wave periods of a standing wave, then the system or process might show alternated physical properties because its entire underlying oscillation pattern is modified. In this sense numbers are potentially able to cause physical effects.

---

* Particles such as electrons or protons are possibly special oscillation states of the space, vacuum or ether, see page 74

Appendix 5

Observations and hypotheses about the numbers e , 3 , π , i ...

An observation and hypothesis about the numbers e , 3 , π

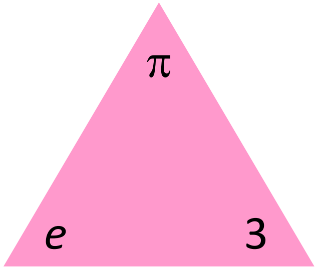
The irrational numbers $e = 2{,}71828\ldots$ (Euler`s number) and $\pi = 3{,}\ 1415926\ldots$ (circle number pi) are important numbers which appear often in mathematics, geometry, physics, and science, i.e. they are inherent in nature and the universe

Observation 12: The numbers e and π are both in the vicinity of the number 3 and

$$e \approx 3 - 2 \times (1/7)$$

$$\pi \approx 3 + 1 \times (1/7)$$

$$e - \pi \approx 3 \times (1/7) \approx 3 \times 0{,}14 = 0{,}42$$



Hypothesis 12: This is not accidental, i.e. there is a deeper reason for that. Possibly the three numbers e , 3 , π represent a kind of trinity that originates or reflects the three states of an oscillation which can be called minus, zero and plus. See also appendix 3

An observation and hypothesis about the numbers e , π , i

The Euler`s identity is usually written as

(a) $e^{i\pi} = -1$

If we take into account the definition of the imaginary unit i , namely

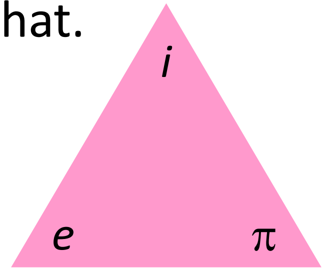
(b) $i^2 = -1$

then the Eulers identity can be expressed as

(c) $e^{i\pi} = i^2$

Observation 13: The Euler`s identity (c) relates the 3 numbers e , π , i with each other

Hypothesis 13: This is not accidental, i.e. there is a deeper reason for that. Possibly the three numbers e , π , i represent a kind of trinity that originates or reflects the three states of an oscillation which can be called minus, plus, and zero. See also appendix 3



Note: Euler`s identity (a) is a special case of Euler`s formula

(d) $e^{ix} = \cos x + i \sin x$

for $x = \pi$

Appendix 6

Is there a relation between
the numbers *e* , 3 , π , and
the unstable elements Tc 43 and Pm 61 and
their surrounding elements such as Nb 41 ?

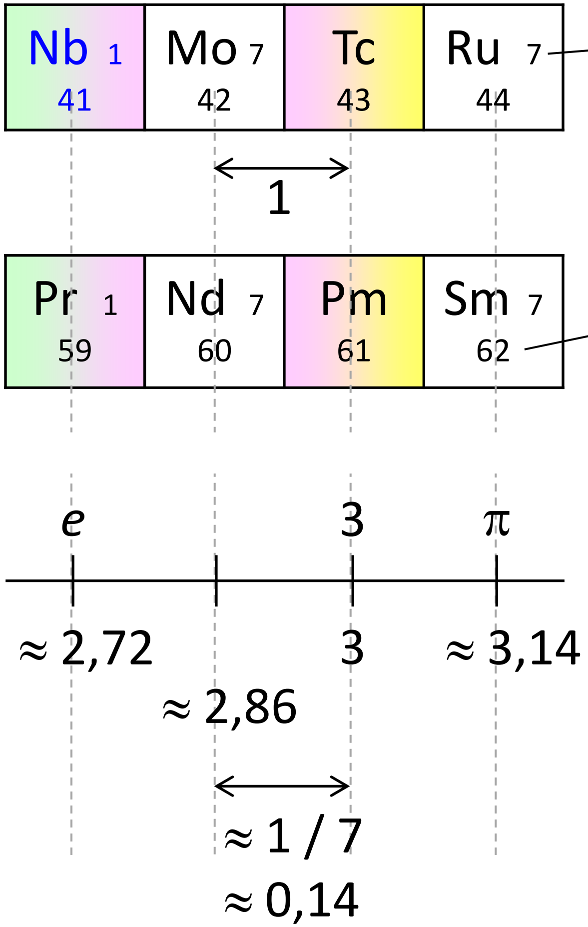
The unstable elements Tc 43 and Pm 61, their surrounding elements, and e , 3 , π

The particular and common features of Tc 43 and Pm 61 and their surrounding elements are presented on page 11 and also here where additionally some features of and among the numbers *e* , 3 , π are displayed - for the latter see also Appendix 5

🟩 Only 1 naturally occuring isotope

🟪 Atomic number is a prime number

🟨 Unstable element



Nb 1 41	Mo 7 42	Tc 43	Ru 7 44
Pr 1 59	Nd 7 60	Pm 61	Sm 7 62

1

e 3 π

≈ 2,72 3 ≈ 3,14

≈ 2,86

≈ 1 / 7

≈ 0,14

Number of naturally occuring isotopes

Atomic number = number of protons or electrons per atom

Do these striking similariities indicate a potential relation between the number 3 and the unstable elements Tc 43 and Pm 61 and their surrounding elements such as Nb 41 ?

3 is a prime number

$e = 2,71828 \ldots$

$\pi = 3,\ 1415926 \ldots$

$3 - e \approx 2 \times (1 / 7)$

$\approx 2 \times 0,14$

$\pi - 3 \approx 1 / 7 \approx 0,14$

Appendix 7

Another tripartitions of the stable chemical elements: The Nb-based tripartition and the Tc/Pm-based tripartition ...

The Nb-based tripartition of the 3 × 3 × 3 × 3 = 81 stable chemical elements 1 / 2

When looking on pages 17 and 19 one might discover another potential tripartition of the stable elements which is given by the central position of Nb 41:

Group B1	**Group B2**	**Group B3**
40 elements left from Nb 41	Nb 41 in the center	40 elements right from Nb 41

This tripartition of the stable elements is shown on the following page. Possibly the three groups B1, B2, and B3 reflect the three states of an oscillation which can be called minus, zero, and plus:

Group B1 / Minus group: 40 elements from He 1 (- 40) to Zr 40 (- 1)

Group B2 / Zero group: 1 element Nb 41 (0)

Group B3 / Plus group: 40 elements from Mo 42 (1) to Bi 83 (40)

This tripartition emphasizes the position of any element relative to that of Nb 41

The Nb-based tripartition of the 3 × 3 × 3 × 3 = 81 stable chemical elements   2 / 2

Nb 41 (0) in the center: 40 elements left (-1 … -40) and 40 elements right (1 … 40) from Nb (0)

H 1 **-40**	He 🟪 2 **-39**	Li 🟪 3 **-38**	Be 🟩 4 **-37**	B 🟪 5 **-36**	C 6 **-35**	N 🟪 7 **-34**	O 8 **-33**	F 🟩 9 **-32**
Ne 10 **-31**	Na 🟩🟪 11 **-30**	Mg 12 **-29**	Al 🟩🟪 13 **-28**	Si 14 **-27**	P 🟩 15 **-26**	S 16 **-25**	Cl 🟪 17 **-24**	Ar 18 **-23**
K 🟪 19 **-22**	Ca 20 **-21**	Sc 🟩 21 **-20**	Ti 22 **-19**	V 🟪 23 **-18**	Cr 24 **-17**	Mn 🟩 25 **-16**	Fe 26 **-15**	Co 🟩 27 **-14**
Ni 28 **-13**	Cu 🟪 29 **-12**	Zn 30 **-11**	Ga 🟪 31 **-10**	Ge 32 **-9**	As 🟩 33 **-8**	Se 34 **-7**	Br 35 **-6**	Kr 36 **-5**
Rb 🟪 37 **-4**	Sr 38 **-3**	Y 🟩 39 **-2**	Zr 40 **-1**	Nb 🟪 41 **0**	Mo 42 **1**	Ru 44 **2**	Rh 🟩 45 **3**	Pd 46 **4**
Ag 🟪 47 **5**	Cd 48 **6**	In 49 **7**	Sn 50 **8**	Sb 51 **9**	Te 52 **10**	I 🟩🟪 53 **11**	Xe 54 **12**	Cs 🟩 55 **13**
Ba 56 **14**	La 57 **15**	Ce 58 **16**	Pr 🟩🟪 59 **17**	Nd 60 **18**	Sm 62 **19**	Eu 63 **20**	Gd 64 **21**	Tb 🟩 65 **22**
Dy 66 **23**	Ho 🟩🟪 67 **24**	Er 68 **25**	Tm 🟩 69 **26**	Yb 70 **27**	Lu 🟪 71 **28**	Hf 72 **29**	Ta 🟪 73 **30**	W 74 **31**
Re 75 **32**	Os 76 **33**	Ir 77 **34**	Pt 78 **35**	Au 🟩🟪 79 **36**	Hg 80 **37**	Tl 81 **38**	Pb 82 **39**	Bi 🟩🟪 83 **40**

Atomic number = number of electrons or protons per atom

Numbering of the box and element

Group B1: - 40 … - 1

Group B2: 0

Group B3: 1 … 40

🟩 Only 1 naturally occuring isotope

🟪 Atomic number is a prime number

The Tc/Pm-based tripartition of the 3 × 3 × 3 × 3 = 81 stable chemical elements 1 / 2

When looking on pages 9 - 12 one might discover another potential tripartition of the stable elements which is given by the two unstable elements Tc 43 and Pm 61:

Group C1: 42 elements left from Tc 43 , from He 1 to Mo 42

Group C2: 17 elements between Tc 43 and Pm 61 , from Ru 44 to Nd 60

Group C3: 22 elements right from Pm 61 , from Sm 62 to Bi 83

This tripartition of the stable elements is shown on the following page. Possibly the three groups C1, C2, and C3 reflect the three states of an oscillation which can be called minus, zero, and plus. A meaningful assignment of the three groups C1, C2, and C3 to the three states minus, zero, and plus seems to be not obvious

The Tc/Pm-based tripartition of the 3 × 3 × 3 × 3 = 81 stable chemical elements 2 / 2

Atomic number = number of protons or electrons per atom

Numbering of the box and element

H 1 1	🟪 He 2 2	🟪 Li 3 3	🟩 Be 4 4	🟪 B 5 5	C 6 6	🟪 N 7 7	O 8 8	🟩 F 9 9
Ne 10 10	🟩🟪 Na 11 11	Mg 12 12	🟩🟪 Al 13 13	Si 14 14	🟩 P 15 15	S 16 16	🟪 Cl 17 17	Ar 18 18
🟪 K 19 19	Ca 20 20	🟩 Sc 21 21	Ti 22 22	🟪 V 23 23	Cr 24 24	🟩 Mn 25 25	Fe 26 26	🟩 Co 27 27
Ni 28 28	🟪 Cu 29 29	Zn 30 30	🟪 Ga 31 31	Ge 32 32	🟩 As 33 33	Se 34 34	Br 35 35	Kr 36 36
🟪 Rb 37 37	Sr 38 38	🟩 Y 39 39	Zr 40 40	🟩🟪 Nb 41 41	Mo 42 42			

Group C1

42 elements

🟩 Only 1 naturally occuring isotope

						Ru 44 43	🟩 Rh 45 44	Pd 46 45
🟪 Ag 47 46	Cd 48 47	In 49 48	Sn 50 49	Sb 51 50	Te 52 51	🟩🟪 I 53 52	Xe 54 53	🟩 Cs 55 54
Ba 56 55	La 57 56	Ce 58 57	🟩🟪 Pr 59 58	Nd 60 59				

Group C2

17 elements

					Sm 62 60	Eu 63 61	Gd 64 62	🟩 Tb 65 63
Dy 66 64	🟩🟪 Ho 67 65	Er 68 66	🟩 Tm 69 67	Yb 70 68	🟪 Lu 71 69	Hf 72 70	🟪 Ta 73 71	W 74 72
Re 75 73	Os 76 74	Ir 77 75	Pt 78 76	🟩🟪 Au 79 77	Hg 80 78	Tl 81 79	Pb 82 80	🟩🟪 Bi 83 81

Group C3

22 elements

🟪 Atomic number is a prime number

About the author ...

About the author

- **Name:** Frank Lichtenberg
- Born **1962** in Bremen (Germany)
- **1983 – 1989:** Study of physics at the University of Heidelberg (Germany)
- **1989 – 1992:** Doctoral thesis in the division of Dr. J. Georg Bednorz at the IBM Zurich Research Laboratory (Switzerland). Doctorate / PhD at the University of Zurich in 1991. **Field of work:** Synthesis of oxides - especially in crystalline form via the melt - and study of their physical and structural properties
- **1992 – 1997:** Research scientist in the nickel metal hydride technology department of Dr. Uwe Koehler at the research center of the battery company VARTA (Germany). Two months stay as guest scientist in Tokyo (Japan) at the TOSHIBA Battery Company within a collaboration between VARTA und TOSHIBA. **Field of work:** Hydrogen storage alloys and nickel metal hydride batteries
- **1997 – 2007:** Research scientist in the department of Prof. Dr. Jochen Mannhart at the Institute of Physics of the University of Augsburg (Germany). **Field of work:** Setting up a new laboratory and synthesis of oxides - especially in crystalline form via the melt - and study of their physical and structural properties
- **2005:** Participation in an 13 - day course in Global Scaling lectured by Hartmut Mueller in Germany
- **2007 – 2010:** Freelance work, autonomous occupation with subjects in the area of physics and science. Creation of several presentations and papers and the website https://novam-research.com about entirely novel and environmentally friendly energy technologies and other new or little-known topics of science
- **Since 2011:** Research scientist in the division of Prof. Dr. Nicola Spaldin at the Department of Materials of the ETH Zurich (Switzerland). See personal ETH webpage and https://theory.mat.ethz.ch/lab.html . **Field of work:** Setting up a new laboratory, synthesis of oxides - especially in crystalline form via the melt - and study of their physical and structural properties, and teaching.

  Secondary employment: **Since 2015** consulting activities for the R & D company Quantum Power Munich